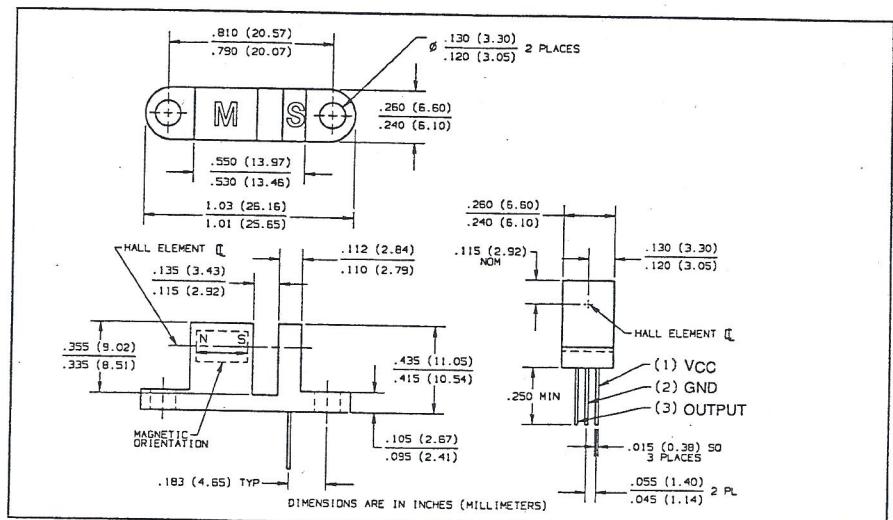
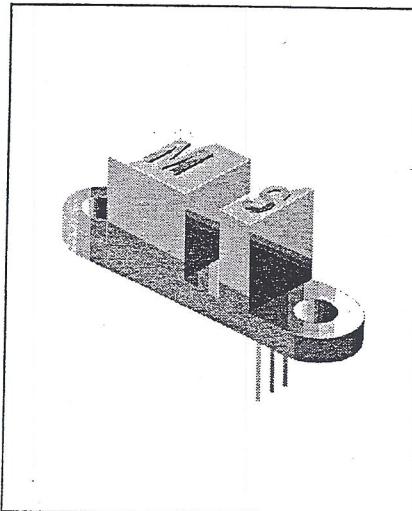


Hallogic® Hall Effect Sensor Assembly Type OHB900



Features

- Non-contact motion sensing
- Operates over a broad range of supply voltages
- Excellent temperature stability
- Hall element, linear amplifier, and Schmitt trigger on a single Hallogic® silicon chip
- Performs in high dust and dirt environments
- 0.125" (3.18mm) wide gap

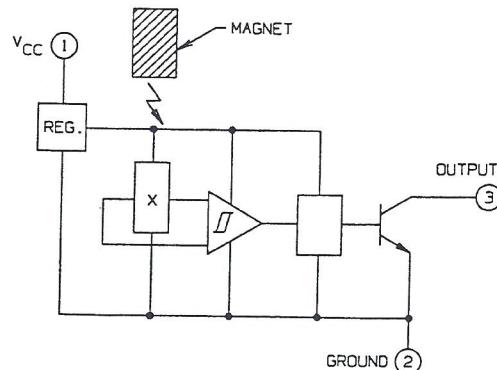
Description

The OHB900 consists of a Hall Effect sensor similar to the OH180U and a rare earth magnet mounted in a low cost plastic housing. The magnet produces optimum magnetic flux at the Hall Effect sensor location. The sensor has an open collector transistor output which is activated when the slot is open. When the slot is blocked by a ferrous material, reducing the magnetic flux density at the Hall Effect sensor location, the open collector output transistor switches off. The device provides up to 25 mA of sink current. Output characteristics are constant at switching frequencies from DC to over 200 kHz.

Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

Supply Voltage, V_{CC}	25 V
Storage Temperature Range, T_S	-50° C to +160° C
Operating Temperature Range, T_A	-50° C to +150° C
Lead Soldering Temperature [1/8 inch (3.2 mm) from case for 5 sec. with soldering iron].....	260° C
Output ON Current, I_{SINK}	25 mA
Output OFF Voltage, V_{OUT}	25 V
Magnetic Flux Density, B	Unlimited

Sensor Functional Block Diagram



Type OHB900

Electrical Characteristics ($V_{CC} = 4.5$ V to 24 V, $T_A = 25^\circ C$ unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
I_{CC}	Supply Current		4	7	mA	$V_{CC} = 24$ V, Output Off
V_{OL}	Output Saturation Voltage		100	400	mV	$V_{CC} = 4.5$ V, $I_{OL} = 20$ mA, Slot Open
I_{OH}	Output Leakage Current		0.1	10.0	μA	$V_{CC} = 4.5$ V, $V_{OUT} = 24$ V, Slot Blocked ⁽¹⁾
t_r	Output Rise Time		0.21	1.00	μs	$R_L = 820 \Omega$, $C_L = 20$ pF
t_f	Output Fall Time		0.25	1.00	μs	

(1) Slot blocked with a ferrous material to interrupt magnetic flux.

Typical Performance Curves

HALL EFFECT
SENSORS

SKU:676-9223 PO#:N/C SMPL 955891-118620

QTY:1 PRT:

ZONE:ZONE12 MFG:LCGGX1A10EC



SA116964 + 1 + 1

5-22-2001 16:43 707

ALLIED ELECTRONICS, INC.

AN ELECTROCOMPONENTS COMPANY

ORDER NUMBER

SA116964

PACKING LIST

Page 1 of 1

SHIP TO:

UNIV OF ARIZONA
STEWARD OBSERVATORY
933 N CHERRY AVE
N122
TUCSON AZ 85721-0009
ATTN: LOG# 125859-220

BILL TO:

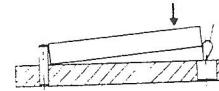
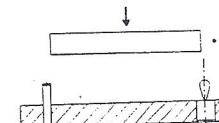
UNIV OF ARIZONA
ACCTS PAYABLE
PO BOX 41030
TUCSON AZ 85717-1030

ORDER DATE	YOUR ORDER NUMBER	ORDERED BY	MODE OF SHIPMENT		SHIP DATE
QUANTITY ORDERED	MANUFACTURER PART NUMBER	MARK SMITH	USPS	STD	05/22/2001
1	LCGGX1A10EC	C & K COMPONENTS INC.			676-9223 EA 1

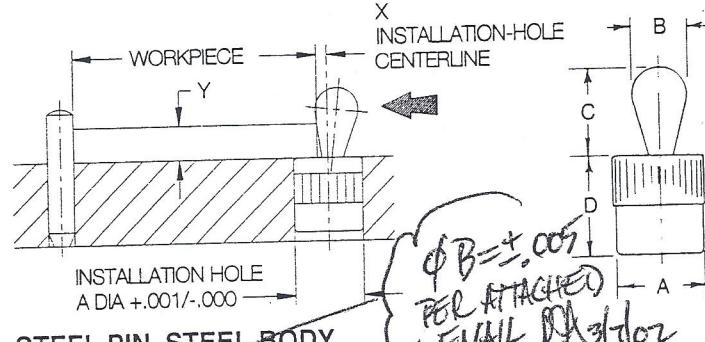
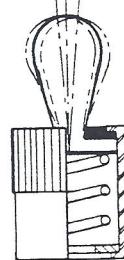
Fm - mainenance

Samuel

SPRING LOCATING PINS

5/8
Dia1/2
Dia7/16
Dia7/16
Dia1/4
Dia

Our patented Spring Locating Pins are an extremely compact way to apply side force to a workpiece. The tapered contact pin is securely anchored in a spring base. Unit installs easily in a drilled hole. Available in five sizes, each in light, medium, or heavy force. Choice of steel, stainless steel, or polyurethane contact pin. Note: The above catalog photos are actual size.


**Steel Pin
Steel Body
(with Spring)**

Most popular version, with a durable case-hardened steel contact pin and steel body containing a coil spring. Protective rubber seal around contact pin keeps out chips and coolant. This type allows the most part-size variation.

PART NO.	A DIA	APPROX SIDE FORCE (LBS)	ALLOWABLE WORKPIECE TOLERANCE	B DIA	C DIA	D	X DIMENSION WHEN Y EQUALS						
							.1/16	1/8	3/16	1/4	5/16	3/8	7/16 OR MORE
CL-4-SLP-1	.250	2.2	.020	.118	.158	.295	.022	.024	.024	.024	.024	.024	.024
CL-4-SLP-2		4.5											
CL-4-SLP-3		9											
CL-7-SLP-1		4.5											
CL-7-SLP-2	.438	11.2	.031	.197	.236	.452	—	.055	.055	.055	.055	.055	.055
CL-7-SLP-3		22.5											
CL-7A-SLP-1		9											
CL-7A-SLP-2	.438	17	.039	.236	.394	.452	—	—	.049	.059	.059	.059	.059
CL-7A-SLP-3		34											
CL-8-SLP-1		11.2											
CL-8-SLP-2	.500	22.5	.051	.315	.512	.532	—	—	—	.077	.087	.087	.087
CL-8-SLP-3		45											
CL-10-SLP-1		22.5											
CL-10-SLP-2	.625	45	.063	.394	.630	.689	—	—	—	—	.098	.107	.110
CL-10-SLP-3		67.5											

STAINLESS STEEL PIN, POLYURETHANE BODY

CL-4-SLPS-1	.250	2.2	.008	.118	.158	.295	.022	.024	.024	.024	.024	.024	.024
CL-4-SLPS-2		4.5											
CL-7-SLPS-1		6.7											
CL-7-SLPS-2	.438	13.5	.016	.197	.236	.433	—	.055	.055	.055	.055	.055	.055
CL-7-SLPS-3		20.2											
CL-7A-SLPS-1		6.7											
CL-7A-SLPS-2	.438	13.5	.016	.236	.394	.433	—	—	.049	.059	.059	.059	.059
CL-7A-SLPS-3		20.2											
CL-8-SLPS-1		11.2											
CL-8-SLPS-2	.500	22.5	.024	.315	.512	.512	—	—	—	.077	.087	.087	.087
CL-8-SLPS-3		33.7											
CL-10-SLPS-1		22.5											
CL-10-SLPS-2	.625	45	.031	.394	.630	.689	—	—	—	—	.098	.107	.110
CL-10-SLPS-3		67.5											

POLYURETHANE PIN, POLYURETHANE BODY

CL-4-SLPP-1	.250	2.2	.008	.118	.158	.295	.022	.024	.024	.024	.024	.024	.024
CL-4-SLPP-2		4.5											
CL-7-SLPP-1		6.7											
CL-7-SLPP-2	.438	13.5	.016	.197	.236	.433	—	.055	.055	.055	.055	.055	.055
CL-7A-SLPP-1		6.7											
CL-7A-SLPP-2	.438	13.5	.016	.236	.394	.433	—	—	.049	.059	.059	.059	.059
CL-8-SLPP-1		11.2											
CL-8-SLPP-2	.500	22.5	.024	.315	.512	.512	—	—	—	.077	.087	.087	.087
CL-8-SLPP-3		33.7											
CL-10-SLPP-1		22.5											
CL-10-SLPP-2	.625	45	.031	.394	.630	.689	—	—	—	—	.098	.107	.110
CL-10-SLPP-3		67.5											


**Polyurethane
Pin
Polyurethane
Body**

Polyurethane contact pin avoids marring soft or finished surfaces. Solid polyurethane body is covered by an aluminum shell.


CARR LANE MANUFACTURING CO.

4200 Carr Lane Ct., P.O. Box 191970

St. Louis, Missouri 63119-2196

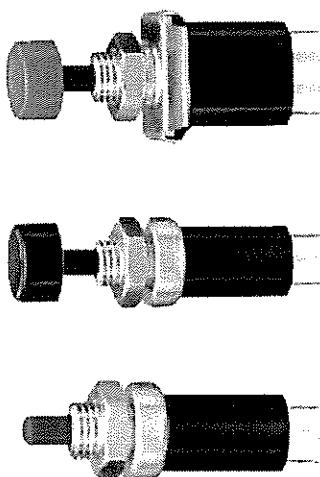
Phone: 314-647-6200, FAX: 314-647-5736

Wiping Contact Pushbutton Switches

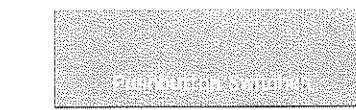
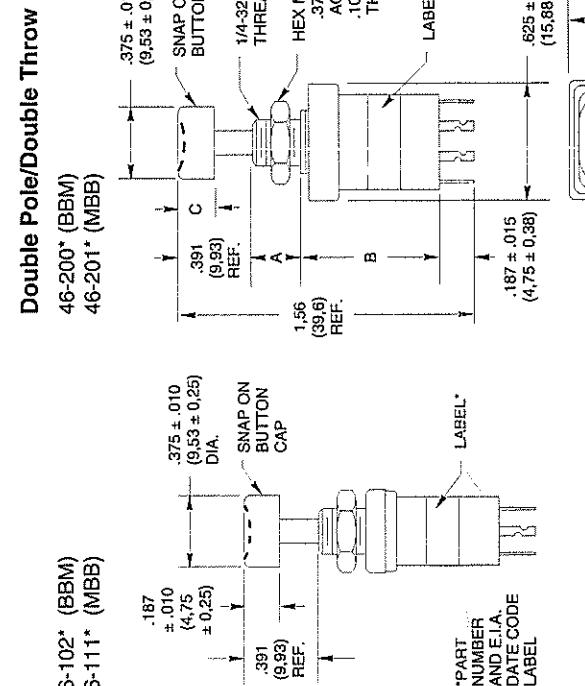
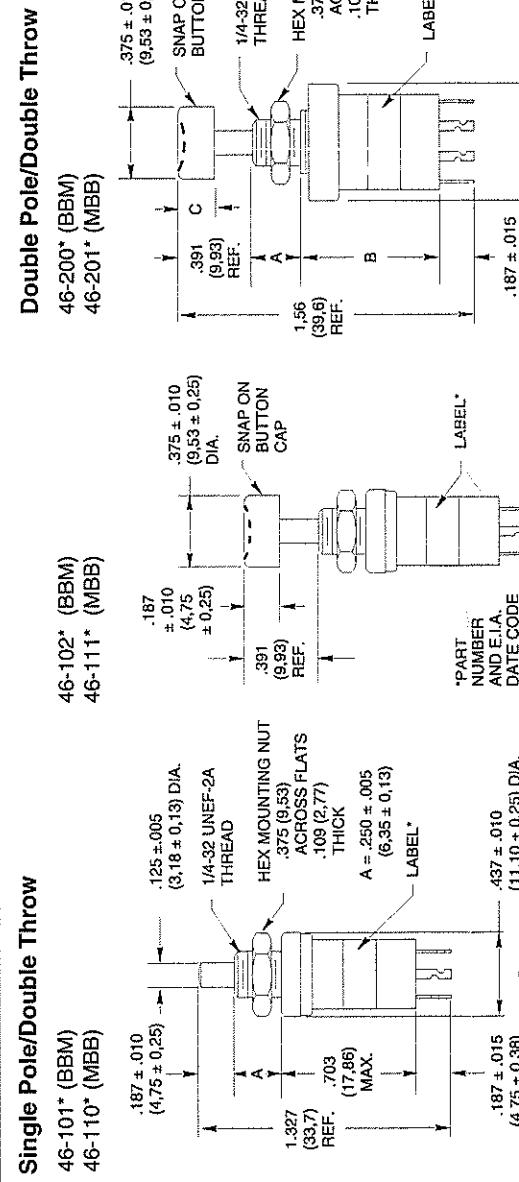
SERIES 46
SPST and DPDT, 1/4 Amp

FEATURES

- Long Wipe Contact Assures High Reliability
- 250,000 Cycles of Operation



DIMENSIONS In Inches (and millimeters)

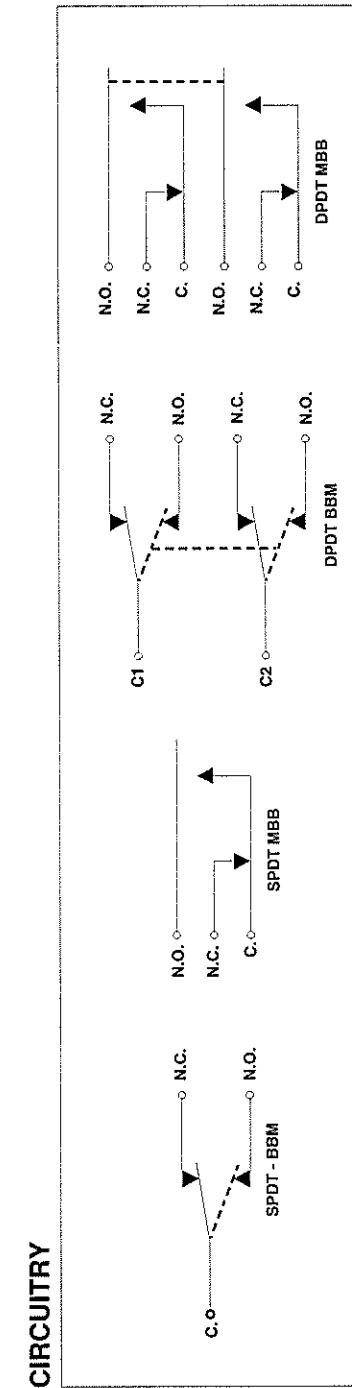


Action	Total Travel Min.	Bottoming Force (oz.)	Mfg. Hole
Momentary	.180 (4.57)	17 ± 5	17/64" (6.75)

Rating at 115 Vac Resistive		Operations at Rated Load	*Complete Part Number	Button or Cap Color	Cap Color
1/4 Amp	1/4 Amp	250,000	46-101 RED	Red	Red
			46-101 BLK	Black	Black
			46-102 RED	Red	Red
			46-102 BLK	Black	Black
			46-110 RED	Red	Red
			46-110 BLK	Black	Black
			46-111 RED	Red	Red
			46-111 BLK	Black	Black

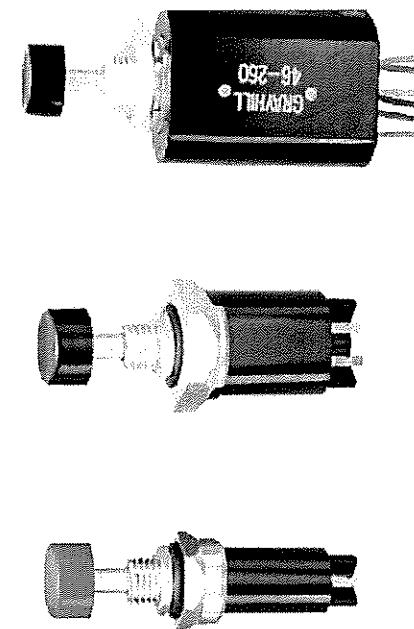
Rating at 115 Vac Resistive		Operations at Rated Load	*Complete Part Number	Cap Color
1/4 Amp	1/4 Amp	250,000	46-200 RED	Red
			46-200 BLK	Black
			46-201 RED	Red
			46-201 BLK	Black

CIRCUITRY



Grayhill Wiping Contact Pushbutton Switches

SERIES 46 SPST and DPDT, 1/4 Amp



FEATURES

- Bushing and Button Seal
- Environmentally Sealed

DIMENSIONS In Inches (and millimeters)

Sealed Bushing and Button Single Pole/Double Throw		Sealed Bushing and Button Double Pole/Double Throw	
46-150* (BBM) 46-151* (MBB)	.375 ± .010 (9.53 ± 0.25) DIA.	46-270* (BBM) 46-271* (MBB)	.375 ± .010 (9.53 ± 0.25) DIA.
	SNAP ON BUTTON CAP 1/4-32 UNEF-2A THREAD		SNAP ON BUTTON CAP 1/4-32 UNEF-2A THREAD
	REF. 391 (9.33)		REF. 391 (9.33)
	A O		A O
	B REF. 1.62 (41.15)		B REF. 1.62 (41.15)
	C REF. .187 ± .015 (4.75 ± 0.38)		C REF. .187 ± .015 (4.75 ± 0.38)
	HEX MOUNTING NUT 3/8 (9.5) ACROSS FLATS .109 (2.8) THICK A = .250 ± .005 B = .770 ± .015 C = .187 ± .010 (4.75 ± 0.25)		HEX MOUNTING NUT 3/12 (7.92) ACROSS FLATS .062 (1.57) THICK A = .250 ± .005 B = .770 ± .015 C = .187 ± .010 (4.75 ± 0.25)
	LABEL* B = .770 ± .015 (19.56 ± 0.38) C = .187 ± .010 (4.75 ± 0.25)		LABEL* B = .770 ± .015 (19.56 ± 0.38) C = .187 ± .010 (4.75 ± 0.25)
	*PART NUMBER AND E.I.A. DATE CODE LABEL 450 (11.43) MAX. ACROSS FLATS OF HEX CORNERS		*PART NUMBER AND E.I.A. DATE CODE LABEL 580 (14.73) MAX. ACROSS FLATS OF HEX 650 (16.5) REF. ACROSS CORNERS
	O = O RING		O = O RING

Terminals are marked as shown in bottom view of SPDT switch on previous page.



Rating at 115 Vac Resistive	Operations at Rated Load	Complete Part Number	Cap Color
1/4 Amp	100,000	46-150 RED 46-150 BLK 46-151 RED 46-151 BLK	Red Black Red Black

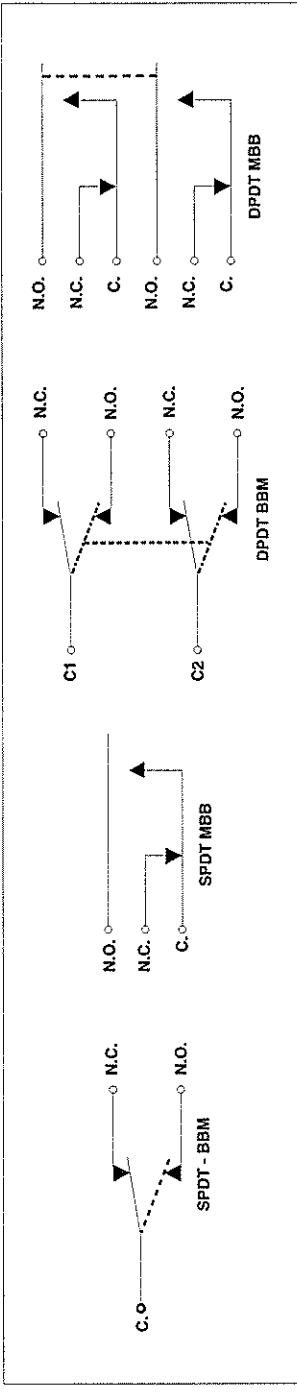
Action	Total Travel	Bottoming Force (oz.)	Mfg. Hole
Momentary	.180 (4.57) Min.	24 ± 4 (6.75)	17/64" (6.75)

Rating at 115 Vac Resistive	Operations at Rated Load	Rating at 220 Vac Resistive	Complete Part Number	Cap Color
1/4 Amp	100,000	1/8 Amp	46-270 RED 46-270 BLK 46-271 RED 46-271 BLK	Red Black Red Black

DPDT BBM

DPDT MBB

CIRCUITRY

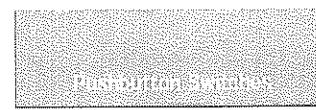
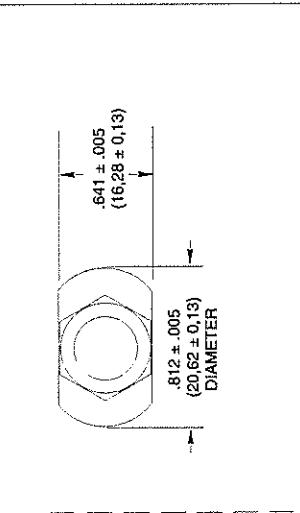
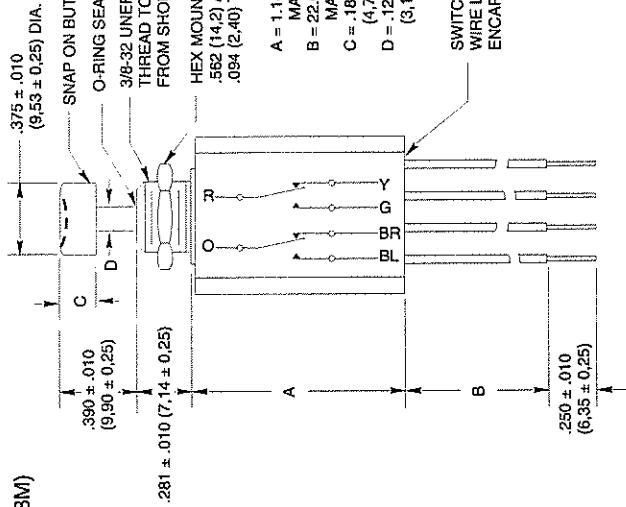


Wiping Contact Pushbutton Switches

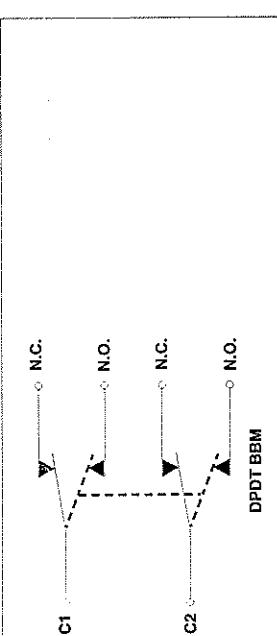
DIMENSIONS In inches (and millimeters)

Environmentally Sealed

Double Pole/Double Throw



CIRCUITRY



SPECIFICATIONS

Rating Criteria

Contact Resistance: Less than 25 milliohms at the switch initially. Less than 4 milliohms/inch of wire.

Voltage Breakdown: 1,000 Vac between mutually insulated parts

Insulation Resistance: 1,000 megohms minimum

Operating Features

Break-Before-Make: Rest position to N.C. break .020" (0.51) minimum. Rest position to N.O. Make .240" (6.10) maximum.

Make-Before-Break: Rest position to N.O. make .065" ± .015 (1.65 ± 0.38). Rest position to N.C. break .130" ± .015 (3.30 ± 0.38).

Operating Temperature: -40°C to +85°C

STANDARD OPTIONS

Epoxy sealed terminals and wire leads, see page D-32.

Decorative mountings, see pages D-23 to D-25.

ACCESSORY

Decorative Mounting Nut	
Part No. 30C1023-1	
Fits .250" (6.35) Bushing	
For dimensions, materials and finishes, see page D-34.	

ORDERING INFORMATION

Description	Part No.
SPDT, BBM, Red Button	46-101 RED
SPDT, BBM, Black Button	46-101 BLK
SPDT, BBM, Red Cap	46-102 RED
SPDT, BBM, Black Cap	46-102 BLK
SPDT, MBB, Red Button	46-110 RED
SPDT, MBB, Black Button	46-110 BLK
SPDT, MBB, Red Cap	46-111 RED
SPDT, MBB, Black Cap	46-111 BLK
SPDT, MBB, Red Cap	46-150 RED
SPDT, MBB, Black Cap	46-150 BLK
SPDT, MBB, Red Cap	46-151 RED
SPDT, MBB, Black Cap	46-151 BLK
DPDT, BBM, Red Cap	46-200 RED
DPDT, BBM, Black Cap	46-200 BLK
DPDT, MBB, Red Cap	46-201 RED
DPDT, MBB, Black Cap	46-201 BLK
DPDT, MBB, Red Cap	46-270 RED
DPDT, BBM, Black Cap	46-270 BLK
DPDT, MBB, Red Cap	46-271 RED
DPDT, MBB, Black Cap	46-271 BLK
DPDT, BBM, Sealed, Red	46-280 RED
DPDT, BBM, Sealed, Black	46-280 BLK

Accessory	Part No.
Decorative Nut	30C1023-1

Available from your local Grayhill Distributor.

For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

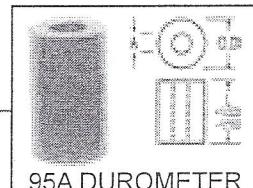
**LBT Dummy MIRROR AND ROTATION LIMITER
REPLACEMENTS FOR STATICS**

Lamina Components

Heavy Duty

Lami-Flex Springs

HEAVY DUTY (cont.)



95A DUROMETER

CATALOG NUMBER	OUTSIDE DIA. (O.D.)	FITS PUNCH SHANK (A)	LENGTH (L)	LOAD LBS. REQD. TO DEFLECT 1/8"	LOAD POUNDS REQUIRED TO DEFLECT						
					5%	10%	15%	20%	25%		
					LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.
LFH22510-125	2-1/4	1	1-1/4	2050	.0625		.1250		.1875		
LFH22510-150			1-1/2	1955	.0750		.1500		.2250		
LFH22510-175			1-3/4	1670	.0875		.1750		.2625		
LFH22510-200			2	1600	.1000		.2000		.3000		
LFH22510-225			2-1/4	1530	.1125	2050	.2250	2580	.3375	N.R.	
LFH22510-250			2-1/2	1470	.1250		.2500		.3750		
LFH22510-275			2-3/4	1410	.1375		.2750		.4125		
LFH22510-300			3	1360	.1500		.3000		.4500		
LFH22510-400			4	1315	.2000		.4000		.6000		
LFH22510-2500			25								
LFH27515-125	2-3/4	1-1/2	1-1/4	2680	.0625		.1250		.1875		
LFH27515-150			1-1/2	2550	.0750		.1500		.2250		
LFH27515-175			1-3/4	2185	.0875		.1750		.2625		
LFH27515-200			2	2125	.1000		.2000		.3000		
LFH27515-225			2-1/4	2000	.1125		.2250		.3375		
LFH27515-250			2-1/2	1920	.1250	2680	.2500	3365	.3750	N.R.	
LFH27515-275			2-3/4	1790	.1375		.2750		.4125		
LFH27515-300			3	1585	.1500		.3000		.4500		
LFH27515-400			4	1435	.2000		.4000		.6000		
LFH27515-2500			25								

EXTRA HEAVY DUTY Lami-Flex Springs

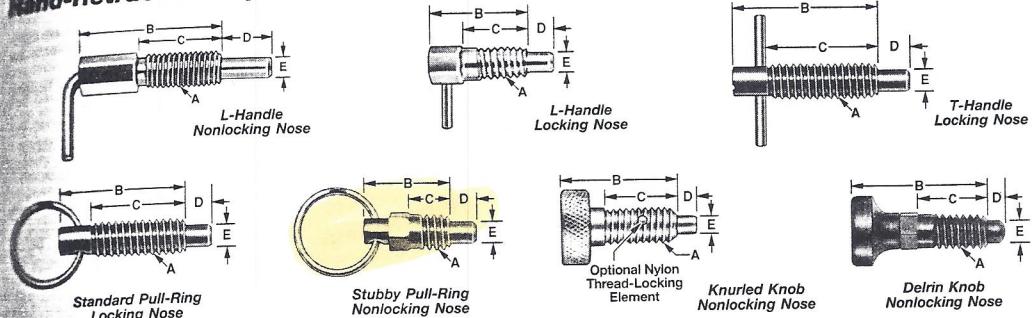
CATALOG NUMBER	OUTSIDE DIA. (O.D.)	FITS PUNCH SHANK (A)	LENGTH (L)	LOAD LBS. REQD. TO DEFLECT 1/8"	LOAD POUNDS REQUIRED TO DEFLECT						
					5%	10%	15%	20%	25%		
					LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.
LFX15063-100	1-1/2	5/8	1	1220	.0500		.1000		.1500		.2000
LFX15063-125			1-1/4	1085	.0625		.1250		.1875		.2500
LFX15063-150			1-1/2	990	.0750		.1500		.2250		.3125
LFX15063-175			1-3/4	905	.0875	1083	.1750	1360	.2625		.3750
LFX15063-200			2	865	.1000		.2000		.3000		.4375
LFX15063-225			2-1/4	815	.1125		.2250		.3375		.5000
LFX15063-250			2-1/2	780	.1250		.2500		.3750		.5625
LFX15063-2500			25								.6250
LFX20088-125	2	7/8	1-1/4	1640	.0625		.1250		.1875		
LFX20088-150			1-1/2	1495	.0750		.1500		.2250		
LFX20088-175			1-3/4	1365	.0875		.1750		.2625		
LFX20088-200			2	1305	.1000		.2000		.3000		
LFX20088-225			2-1/4	1225	.1125	1640	.2250	2055	.3375	N.R.	
LFX20088-250			2-1/2	1175	.1250		.2500		.3750		
LFX20088-275			2-3/4	1075	.1375		.2750		.4125		
LFX20088-300			3	975	.1500		.3000		.4500		
LFX20088-2500			25								
LFX25010-125	2-1/2	1	1-1/4	3765	.0625		.1250		.1875		
LFX25010-150			1-1/2	3445	.0750		.1500		.2250		
LFX25010-175			1-3/4	2950	.0875		.1750		.2625		
LFX25010-200			2	2780	.1000		.2000		.3000		
LFX25010-225			2-1/4	2610	.1125	3765	.2250	4875	.3375	N.R.	
LFX25010-250			2-1/2	2445	.1250		.2500		.3750		
LFX25010-275			2-3/4	2345	.1375		.2750		.4125		
LFX25010-300			3	2265	.1500		.3000		.4500		
LFX25010-400			4		.2000		.4000		.6000		
LFX25010-2500			25								

95A Durometer Product is Blue

Hand Retractable Spring Plungers

See page 2018 for an index of tooling and fixturing products.

Hand-Retractable Spring Plungers



Easy-to-retract plungers are ideal for securing, fastening, positioning, locating, and indexing. Just pull on the handle to fully retract the nose into the plunger body. Nose ends are tapered for easy alignment. Available in nonlocking and locking nose styles. The locking nose styles have a handle (or knob) rest position that allows the nose to remain inside the plunger body when retracted. Turning the handle unlocks and extends the nose.

To Order Available with and without a nylon thread-locking element that resists vibration. Please specify with or without nylon thread-lock-

ing element.

L-handle and **T-handle** plungers have easy-grip handles. Steel

plungers have a zinc-plated finish.

Pull-ring plungers are excellent for limited-space applications.

Steel pull-ring plungers have a zinc-plated finish.

Knob plungers have a large bearing surface that handles heavy side

loads. Available with a knurled steel knob and with a smooth Delrin

knob. Steel knob plungers have black knobs and a black-oxide finish.

Stainless steel Delrin plungers have white knobs.

Thread Size	O'all Lg. A	Body Lg. B	Nose Lg. C	Nose Dia. D	End Force, lbs. Initial	End Force, lbs. Final	Steel Each	Stainless Steel Each
L-Handle, Nonlocking Nose								
#-20	0.75"	0.5"	0.2"	0.16"	0.12	0.5	8498A61	\$9.25
#-20	1.25"	0.8"	0.38"	0.16"	0.5	2.5	8498A62	9.25
#-18	1.13"	0.75"	0.3"	0.25"	0.25	1.25	8498A63	10.52
#-18	2"	1.31"	0.56"	0.25"	0.75	3.75	8498A64	10.52
#-13	1.5"	1.00"	0.40"	0.31"	0.5	2.0	8498A65	12.51
#-13	2.11"	1.25"	0.75"	0.31"	1.0	5.0	8498A66	12.51
#-13	1.88"	1.25"	0.50"	0.38"	0.75	2.5	8498A67	14.37
#-13	3.05"	2.00"	1.00"	0.38"	1.0	5.0	8498A68	14.37
L-Handle, Locking Nose								
#-20	0.75"	0.50"	0.20"	0.16"	0.12	0.5	3403A11	9.23
#-20	1.25"	0.80"	0.38"	0.16"	0.5	2.5	3403A12	10.26
#-18	1.13"	0.75"	0.30"	0.25"	0.25	1.25	3403A13	10.52
#-18	2.00"	1.31"	0.56"	0.25"	0.75	3.75	3403A14	11.69
#-13	1.50"	1.00"	0.40"	0.31"	0.5	2.0	3403A15	12.51
#-13	2.11"	1.25"	0.75"	0.31"	1.0	5.0	3403A16	13.88
#-11	1.88"	1.25"	0.50"	0.38"	0.75	2.5	3403A17	14.37
#-11	3.05"	2.00"	1.00"	0.38"	1.0	5.0	3403A18	15.96
Metric L-Handle, Locking Nose								
M6x1.0	32 mm	20 mm	10 mm	4 mm	0.5	2.5	8501A54	11.96
M10x1.5	51 mm	33 mm	14 mm	6 mm	0.75	3.75	8501A55	13.64
M12x1.75	54 mm	32 mm	19 mm	7 mm	1.0	5.0	8501A56	16.16
T-Handle, Locking Nose								
#-20	1.14"	0.80"	0.25"	0.155"	1.0	2.5	31265A16	10.26
#-16	1.68"	1.20"	0.38"	0.233"	2.0	4.0	31265A25	11.71
#-13	2.00"	1.40"	0.50"	0.312"	2.5	5.0	31265A36	13.88
#-11	2.38"	1.70"	0.63"	0.375"	2.5	5.0	31265A46	15.95
Metric Pull-Ring, Locking Nose								
M6x1.0	1.14"	0.80"	0.25"	0.155"	1.0	2.5	8487A21	10.27
M10x1.5	1.68"	1.20"	0.375"	0.233"	2.0	4.0	8487A22	11.69
M13x1.75	2.00"	1.40"	0.50"	0.312"	2.5	5.0	8487A23	13.88
Stubby Pull-Ring, Nonlocking Nose								
#-20	0.57"	0.31"	0.19"	0.16"	0.5	2.0	8487A24	9.24
#-20	0.57"	0.31"	0.19"	0.16"	0.5	2.0	8487A25	9.24
#-16	0.82"	0.44"	0.28"	0.25"	0.75	3.0	8487A26	10.54
#-13	1.06"	0.56"	0.38"	0.31"	1.0	4.0	8487A27	12.51
#-11	1.31"	0.69"	0.44"	0.38"	1.125	5.0	8487A28	14.37
Knurled Knob, Nonlocking Nose								
#-32	0.65"	0.40"	0.94"	0.104"	0.5	3.0	84915A44	6.86
#-20	0.813"	0.50"	0.125"	0.123"	1.0	4.0	84915A45	7.44
#-18	1.00"	0.625"	0.188"	0.154"	1.0	6.0	84915A46	8.11
#-16	1.25"	0.75"	0.218"	0.185"	1.0	8.0	84915A47	8.85
#-13	1.50"	0.875"	0.250"	0.248"	1.0	10.0	84915A48	9.45
Knurled Knob, Locking Nose								
#-20	0.805"	0.40"	0.125"	0.123"	0.5	2.0	84915A41	7.44
#-16	1.26"	0.75"	0.22"	0.185"	0.5	3.0	84915A42	8.85
#-13	1.38"	0.65"	0.25"	0.248"	0.5	4.0	84915A43	9.45
Delrin Knob, Nonlocking Nose								
#-20	0.97"	0.63"	0.13"	0.16"	0.12	0.36	8497A11	8.16
#-16	1.40"	0.75"	0.18"	0.25"	0.25	2.0	8497A15	11.59
#-13	1.90"	1.00"	0.250"	0.31"	0.5	1.75	8497A16	13.69
Delrin Knob, Locking Nose								
#-20	0.97"	0.63"	0.13"	0.16"	0.12	0.36	8497A11	8.16
#-16	1.40"	0.75"	0.18"	0.25"	0.25	2.0	8497A12	9.17
#-13	1.90"	1.00"	0.250"	0.31"	0.5	1.75	8497A13	10.34

* Pull ring diameter is larger than 8487A24 and 8500A27. ■ Has a rounded nose. Dimension "E" represents nose radius.

* Nose diameter tolerance is +.001" to -.000".



SEARCH CENTER

New



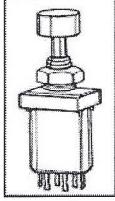
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ITEM DATA

Newark Part #:	23F899	 <small>Click image to enl</small>
Manufacturer Part #:	46-200 RED	
Manufacturer Name:	GRAYHILL INC	
Category:	Switches/Push button	

ORDER NOW! Quantity

Item Descriptions with * are drop ship, VENDOR MINIMUM APPLIES - call 1-800-4NEWARK for minimum.

ORDERING INFO	
1 to 24	\$11.11
25 to 49	\$10.00
50 to 99	\$9.00
100 to 249	\$8.28
250 to 499	\$7.95
500 to 999	\$7.63
Over 999	Contact your local sales branch for pricing information.
Available	89
Price Each	\$11.11
Unit of Measure	Each
Minimum Order Quantity	1
Order Multiple	1
Catalog 120 Page	688
Catalog 119 Page	1026
Catalog 118 Page	1038

ORDER NOW! Quantity

PARAMETRIC DATA	
Description:	Switch, Series 46, DPDT Wiping Contact, 0.921 inch x inch Width, 0.266 inch H Button

ADDITIONAL INFORMATION	
	 Info Sheet

.921" x .625" width
.266 hole.

90 PRIME
FILTER ACCESS DOOR
SWITCH

(5072)

(de50973)



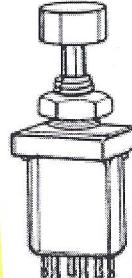
46 SERIES SPDT AND DPDT 1/4 AMP WIPING CONTACT PUSHBUTTON SWITCHES



46-101



46-102



46-200



46-05-05



46-05-08

Clean wiping contact switches have consistent contact resistance for low-voltage applications. 46 series rated to make and break 250mA at 115VAC, 250,000 operations. All switches have break-before-make contacts. *Order hardware separately* [click here](#).

Type	Panel Size	Button	Cir-cuits	Stock No.
46-101 RED	0.890" x 0.437"	Red (0.266" Dia.)	SPDT	23F895
46-101 BLK	0.890" x 0.437"	Black (0.266" Dia.)	SPDT	23F894
46-102 RED	0.890" x 0.437"	Red (0.375" Dia.)	SPDT	23F897
46-102 BLK	0.890" x 0.437"	Black (0.375" Dia.)	SPDT	23F896
46-200 RED	0.921" x 0.625"	Red (0.266" Dia.)	DPDT	23F899
46-200 BLK	0.921" x 0.625"	Black (0.266" Dia.)	DPDT	23F898
46-05-05-502-0707	1.179" x 0.640"	Black (0.516" Dia.)	SPDT	57F2644
46-05-05-502-0303	1.179" x 0.640"	Red (0.516" Dia.)	SPDT	57F2645
46-05-08-502-0707*	1.188" x 0.76"	Black (0.641" Dia.)	DPDT	57F2648

Photo
ial C

Photo Edmund Industrial Co.

Phone: 856-573-50 FAX: 856-573-6295
"Optics" 101 East Gloucester Pike • Barrington, NJ 08007-1380 U.S.A.

Phone: 856-573-50 FAX: 856-573-6295
"Optics" 101 East Gloucester Pike • Barrington, NJ 08007-1380 U.S.A.

12/27/0367 01E92154
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933 N CHERRY AVE NZ
TUCSON AZ 85721

**SEE ADDITIONAL
INFORMATION
ON REVERSE
SIDE**

Y.	ITEM	MAGNET
20	L38428	

QTY.	ITEM	DESCRIPTION	UNIT PRICE (US\$)	AMOUNT (US\$)
20	L38428	MAGNET NEODYMIUM IRON BORON	2.0	

MAGNETS
 FILTER ~~NO~~
 CALLED OUT
 FILTER HOT

Order Date: 11/13/01 P.O. # : C153742
Key: N017U900 Contact : mcclelland
11/13/01

Page : 1 Last page

Edmund Industrial Optics
101 East Chelmsford Street
Billerica, MA 01821-2700

UNIV OF ARIZONA
MCCLENDON
STEWARD OBSERVATORY



THE UNIVERSITY OF ARIZONA®
PROCUREMENT & CONTRACTING SERVICES
PURCHASING DEPARTMENT
CORRESPONDENCE ONLY

PURCHASE ORDER NUMBER

6

153742

MAIN CAMPUS - PO DRAWER 40370 HEALTH SCIENCES CENTER - PO BOX 245107
 TUCSON AZ 85717-0370 (520)621-1747 TUCSON, ARIZONA 85724-5107 - (520) 626-6714

PURCHASE ORDER WITH CHECK

CONTRACT OR QUOTE NUMBER:

BUYERS NAME: DWIGHT W. GIBBS

SHIP TO:

SHIPPING LABELS MUST CONTAIN COMPLETE SHIPPING ADDRESS, INCLUDING PURCHASE ORDER NUMBER.

1. VERIFY ORDER AGAINST YOUR REQUESTION. FAILURE TO NOTIFY PURCHASING WITHIN 5 WORK DAYS FROM DATE OF ORDER INDICATES P.O. IS CORRECT AS ISSUED.
 2. AFTER SHIPMENT IS RECEIVED, REPORT IMMEDIATELY ANY ERRORS OR DISCRIPANCY BY COMPLETING AN EXCEPTION REPORT.

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MCCLENDON
STEWARD OBSERVATORY
933 N. CHERRY AVE.
RM N208
TUCSON AZ 85721
P.O. C 153742

COMMENTS

LINE	QUANTITY	UNIT	NOTIFY US AT ONCE IF YOU CANNOT FURNISH THIS ORDER	UNIT PRICE	EST. AMOUNT
1	20	EA	#L38-428, MAGNET DISC, NEODYMIUM IRON BORON, .187 X .062	2.20	44.00
DELIVERY DATE				ESTIMATED TOTAL	44.00
				USE TAX	2.46

VENDOR NO.	REQ.NO.	ACCOUNT NO.
V0007181772	R845042	3108705290

CHECK NUMBER

153742

CHECK DATE

11/07/01

EDMUND INDUSTRIAL OPTICS
101 EAST GLOUCESTER PIKE
BARRINGTON NJ 08007-1380

About Rubber

Rubber is used for shock absorption, cushioning, vibration control, insulating, and sealing. The ratings shown below are to help you make general comparisons between rubbers. For more detailed information, see individual product presentations.

Material Selector Pack—Includes one individually marked piece of each of the materials listed below. Sizes are 4" x 4" and 6" x 6". Thickness is $\frac{1}{16}$ ".

8450K2

Each \$24.91

Rubber and Natural Rubber	Page(s)		Oil Resistance	Electrical Resistance	Flame Resistance	Impact Resistance	Abrasion Resistance	Tear Resistance	Weather Resistance	Oxidation Resistance	Ozone Resistance
Latex and Natural Rubber	3226-3227	Poor	Excl	Poor	Excl	Excl	Excl	Fair	Fair	Poor	
Pure Gum Rubber	3227	Poor	Excl	Poor	Good	Excl	Good	Poor	Good	Fair	
SBR (styrene-butadiene)	3227-3228	Poor	Good	Poor	Excl	Very Good	Fair	Fair	Good	Fair	
Buna-N (nitrile)	3228-3230	Excl	Poor	Poor	Good	Good	Fair	Poor	Good	Fair	
Butyl	3230	Poor	Excl	Poor	Fair	Good	Good	Very Good	Excl	Good	
Neoprene	3231-3235	Good	Very Good	Good	Good	Excl	Good	Very Good	Excl	Excl	
ECH (epichlorohydrin)	3236	Excl	Good	Poor	Fair	Good	Fair	Good	Good	Very Good	
Hypalon	3236	Good	Excl	Good	Fair	Excl	Fair	Excl	Excl	Excl	
EPDM (ethylene-propylene-diene-methylene)	3236-3237	Poor	Excl	Poor	Good	Good	Good	Very Good	Excl	Excl	
Silicone	3238-3241	Fair	Good	Fair	Fair	Poor	Poor	Excl	Excl	Excl	
Viton	3242	Excl	Good	Good	Very Good	Good	Fair	Very Good	Excl	Excl	
Santoprene	3242	Good	Excl	Good	Good	Fair	Good	Excl	Excl	Excl	
Vinyl	3243	Good	Not Rated	Poor	Good	Fair	Fair	Good	Good	Good	
Polyurethane	3243-3248	Excl	Excl	Fair	Good	Excl	Excl	Good	Excl	Excl	
Sorbothane	3248	Good	Poor	Poor	Excl	Fair	Fair	Good	Good	Poor	

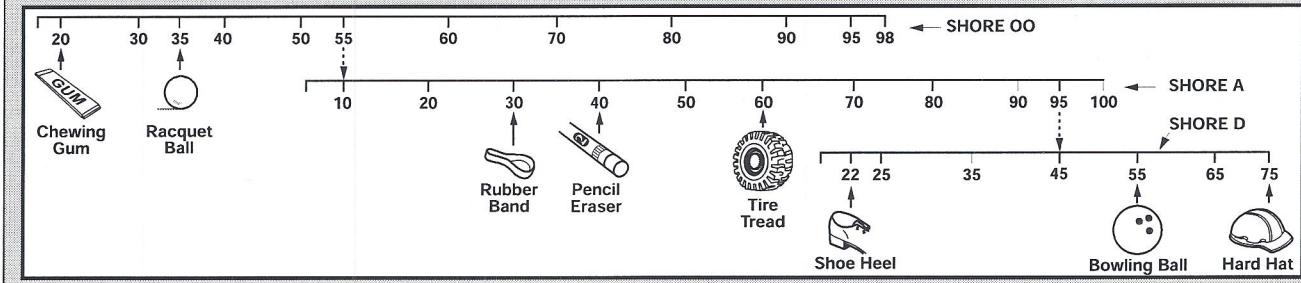
About Durometer Scales

Durometer is the international standard for measuring the hardness of rubber, foam rubber, plastic, and most nonmetallic materials. Foam rubbers are usually measured on the Shore OO scale; solid rubbers on the Shore A scale. One object may fall within more than one scale—for example, a typical shoe heel is 95 Shore OO, 70 Shore A, and 22 Shore D. If you're unsure of the hardness you need, try our sample pack provided below. Note: Durometer hardness ratings listed on the following pages have a tolerance of $\pm .5$.

Durometer Sample Pack—Includes 12 samples, one of each of the following durometers: 40, 50, 70 Shore OO; 30, 40, 50, 60, 70, 80, 90, and 95 Shore A; and 75 Shore D. Sizes vary; largest size is 6" x 6". Thicknesses range from $\frac{1}{8}$ " to $\frac{1}{4}$ ".

8450K1

Each \$9.48



Natural Foam Rubber

Natural Foam Rubber Strips



Firmness Rating	4 to 5
Tensile Strength, psi	95
Elongation %	226
Compression (25% Deflection), psi	5 to 9
Density, lbs./cu. ft.	.24

Even when you compress this open-cell foam rubber to half its thickness, it quickly returns to its original shape. Made from a polymer found in the sap of rubber trees, these adhesive-backed strips have high tear strength, wear resistance, and abrasion resistance. Material should be used in areas with low to no sunlight. Temperature range of rubber and acrylic adhesive is -20° to $+160^{\circ}$ F. Roll lengths are 50 ft. Color is black.

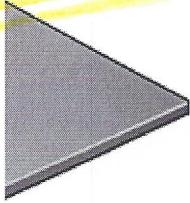
Note: For more information about foam and firmness rating scales, see page 3249.

Width	$\frac{1}{16}$ " Thick ($\pm .015"$) Each		$\frac{1}{8}$ " Thick ($\pm .015"$) Each		$\frac{5}{32}$ " Thick ($\pm .030"$) Each	
	$\frac{3}{8}$ "	93625K43	\$5.30	93625K53	\$5.46	93625K21
$\frac{1}{2}$ "	93625K44	6.51	93625K54	6.78	93625K11	7.55
$\frac{5}{8}$ "	93625K45	7.68	93625K55	8.02	93625K22	9.14
$\frac{3}{4}$ "	93625K46	9.16	93625K56	9.57	93625K12	10.26
1"	93625K47	11.39	93625K57	11.93	93625K13	12.66
1 1/2"	93625K48	15.19	93625K58	15.94	93625K31	16.35
2"	93625K49	19.27	93625K59	20.22	93625K32	21.75
3"	93625K29	32.00	93625K33	35.55	93625K34	35.55
4"	93625K82	42.66	93625K83	71.50	93625K84	47.36
6"	93625K92	63.98	93625K93	107.25	93625K94	71.07
Width	$\frac{1}{4}$ " Thick ($\pm .030"$) Each		$\frac{5}{16}$ " Thick ($\pm .030"$) Each		$\frac{3}{8}$ " Thick ($\pm .040"$) Each	
	$\frac{3}{8}$ "	93625K61	\$8.33	93625K23	\$9.69	93625K71
$\frac{1}{2}$ "	93625K62	10.15	93625K14	11.86	93625K72	13.46
$\frac{5}{8}$ "	93625K63	12.15	93625K24	13.94	93625K73	16.31
$\frac{3}{4}$ "	93625K64	13.85	93625K15	15.89	93625K74	18.73
1"	93625K65	17.51	93625K16	20.07	93625K75	24.05
1 1/2"	93625K66	23.33	93625K41	26.98	93625K76	32.49
2"	93625K67	31.20	93625K42	35.94	93625K77	43.79
3"	93625K35	49.16	93625K36	56.34	93625K37	67.52
4"	93625K85	65.57	93625K86	75.11	93625K87	90.05
6"	93625K95	98.34	93625K96	112.66	93625K97	135.07
Width	$\frac{7}{16}$ " Thick ($\pm .040"$) Each		$\frac{1}{2}$ " Thick ($\pm .050"$) Each		$\frac{5}{8}$ " Thick ($\pm .060"$) Each	
	$\frac{3}{8}$ "	93625K25	\$12.56	93625K17	\$15.14	
$\frac{1}{2}$ "	93625K26	18.61	93625K22	21.65		
$\frac{5}{8}$ "	93625K18	27.75	93625K19	36.94		
$\frac{3}{4}$ "	93625K52	49.57	93625K51	47.36		
1"	93625K38	77.89	93625K39	103.86		
1 1/2"	93625K98	155.77	93625K99	155.77		

We would love to hear your comments.

Natural Rubber > Material > Latex and Natural Rubber Material Type

Rubber



32 products match your selections

Material	Latex and Natural Rubber
Latex and Natural Rubber	
Material Type	Natural Latex Rubber
Form	Sheets
Durometer	38 Shore A
Type	Plain Back
Tensile Strength	3850 psi
Temperature Range	-40° to +158° F
Color	Red

 Catalog Page
 Matching Items

Length:

12" | 24" | 48" | Cut-to-Order

Width:

12" | 24" | 49"

Thickness:

1/16" | 1/8" | 3/16" | 1/4" | 3/8" | 1/2" | 3/4" | 1"

1/4"	±.031"	8633K56	7.75	8633K36	13.93	8633K16	18.78
3/8"	±.047"	8633K57	10.44	8633K37	18.93	8633K17	25.36
1/2"	±.047"	8633K58	13.93	8633K38	25.32	8633K18	33.78
3/4"	±.093"	8633K61	18.89	8633K41	34.61	8633K21	46.13
1"	±.100"	8633K63	27.04	8633K43	49.47	8633K23	61.42

Off-White

1/16"	±.016"	87145K71	2.70	87145K81	4.80	87145K91	5.60
1/8"	±.020"	87145K73	5.33	87145K83	9.49	87145K93	11.08
3/16"	±.031"	87145K74	8.08	87145K84	14.36	87145K94	16.82
1/4"	±.031"	87145K75	10.75	87145K85	19.11	87145K95	22.42

Balls

Dia.	Pkg. Qty	Per Pkg.	
5/8"	10	96385K61	\$4.86
1"	10	96385K62	9.23
1 1/8"	10	96385K63	10.87
1 3/8"	10	96385K64	12.65
2"	5	96385K68	9.30

Natural Latex Rubber

Durometer	38A
Tensile Strength, psi	3850
Elongation %	810

This material is made of 95% natural latex and has exceptional tear resistance. Color is red. Temperature range is -40° to +158° F.

Thick.	Thickness Tolerance	12" x 12" Sheets		12" x 48" Sheets	
		Each	Each	Each	Each
1/16"	+.020", -.028"	86085K101	\$8.72	86085K121	\$32.89
1/8"	+.017", -.031"	86085K102	16.65	86085K122	59.22
3/16"	+.033", -.015"	86085K103	22.07	86085K123	75.67
1/4"	+.010", -.037"	86085K104	28.68	86085K124	97.11
3/8"	+.042", -.005"	86085K105	41.10	86085K125	139.78
1/2"	+.075", -.067"	86085K106	55.50	86085K126	188.33
3/4"	+.156", -.041"	86085K107	80.74	86085K127	273.89
1"	+.079", -.110"	86085K108	100.03	86085K128	339.67

Thick.	Thickness Tolerance	24" x 24" Sheets		Nominal 49" Wd. Sheeting	
		Each	Each	Per Lin. Ft.	Per Lin. Ft.
1/16"	+.020", -.028"	86085K111	\$26.93	86085K21	\$22.67
1/8"	+.017", -.031"	86085K112	51.39	86085K31	42.34
3/16"	+.033", -.015"	86085K113	68.45	86085K41	56.45
1/4"	+.010", -.037"	86085K114	89.01	86085K51	74.00
3/8"	+.042", -.005"	86085K115	127.86	86085K61	106.48
1/2"	+.075", -.067"	86085K116	172.36	86085K71	143.27
3/4"	+.156", -.041"	86085K117	250.98	86085K81	209.11
1"	+.079", -.110"	86085K118	310.90	86085K91	258.73

Pure Gum Foam Rubber Sheeting

COMPARABLE SPECS.

Composition Percent	SYM1 Sintered Bronze	SYM2 Sintered Bronze - High Density	SYM77 Sintered Iron-Copper
ASTM	B-438-83	B-255-61	B-439-83
...	Gr. 1, Type 2	Type 2	Grade 4
Military	Mil-B-5687D	...	Mil B-5687D
...	Type 1, Grade 1	...	Type 2, Grade 4
MPIF Standard 35	CT-1000-K26
SAE
- New	841	842	863
- Old	Type 1, Class A	...	Type 3
AMS	4805
Symmco Designation	Sym 1	Sym 2	Sym 77

TOLERANCES

PLAIN & FLANGED BEARINGS Inside & Outside Diameters (Inches)

Dimensions		
Over	Up to & Including	Tolerance
...	1/2	+.000 - .001
1/2	1	+.000 - .001
1	1-1/2	+.000 - .001
1-1/2	2-1/2	+.000 - .0015
2-1/2	3-1/2	+.000 - .002
3-1/2	4-1/2	+.000 - .0025

Length

Over	Up to & Including	Tolerance
...	1-1/2	+/- .005
1-1/2	3	+/- .0075
3	4-1/2	+/- .010

*SYMMCO
INCORPORATED*

Over	Up to & Including	Tolerance
...		+/- .005
1-1/4	1-1/4	+/- .010
2-1/2	2-1/2	+/- .015
Thickness	4	+/- .0025

Outside Diameter

Over	Up to & Including	Tolerance
...	1-1/2	+/- .010
1-1/2	3	+/- .015
3	4-1/2	+/- .020

Parallelism of Faces - Based on OD

Over	Up to & Including	Tolerance
...	1-1/2	.002
1-1/2	3-1/2	.003
3-1/2	4	.004

RUNNING CLEARANCE

Proper running clearance for bearings depends to a great extent on the particular application. Only minimum recommended clearances for oil impregnated bearing used with ground steel shafting are listed.

Running Clearances

Shaft Size, In.	Clearance, Min. In. Bronze Base	Clearance, Min. In. Iron Base
Up to 0.760	0.0005	.001
0.761 to 1.510	0.001	.0015
1.511 to 2.510	0.0015	.002
Over 2.510	0.002	.0025

PRESS FITS

Plain cylindrical journal bearings are commonly installed by press fitting the bearing into a housing with an insertion arbor. For housings rigid enough to withstand the press fit without appreciable distortion and for bearings with thickness approximately one-eighth of the

bearing outside diameter, the press fits shown are recommended.

Recommended Press Fits

Outside Dia., In.	Press Fit In. Min.	Press Fit In. Max.
Up to 0.760	0.001	0.003
.760 to 1.510	0.0015	0.004
1.511 to 2.510	0.002	0.005
2.511 to 3.010	0.002	0.006
Over 3.010	0.002	0.007

Email Symmco:
sales@symmco.com

SS-612-B
SLEEV(E OI) = .377 .377
- .001 - .003

.376 .374

Symmco Sintered Bronze Sleeve Bearings

I.D.	O.D.	LENGTH	SYMMCO NO.
1/8 .127	3/16 .1895	1/4	SS-46-4
		1/2	SS-46-8
1/8 .127	1/4 .252	1/8	SS-48-2
		1/4	SS-48-4
		3/8	SS-48-6
		1/2	SS-48-8
1/8 .127	5/16 .3145	1/4	SS-410-4
		3/8	SS-410-6
		1/2	SS-410-8
3/16 .189	1/4 .252	1/4	SS-68-4
		3/8	SS-68-6
		1/2	SS-68-8
		5/8	SS-68-10
		3/4	SS-68-12
3/16 .190	5/16 .3145	1/4	SS-610-4
		3/8	SS-610-6
		1/2	SS-610-8
		5/8	SS-610-10
		3/4	SS-610-12
		1	SS-610-16
3/16 .190	3/8 .377	3/8	SS-612-6
		1/2	SS-612-8
		5/8	SS-612-10
		3/4	SS-612-12
1/4 .252	5/16 .315	1/4	SS-810-4
		3/8	SS-810-6
		1/2	SS-810-8
		3/4	SS-810-12

SOLID BRK
STOCK

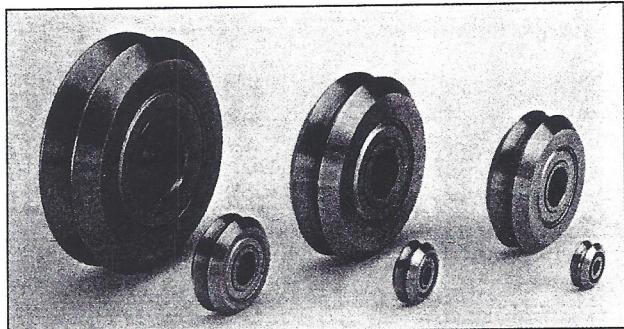
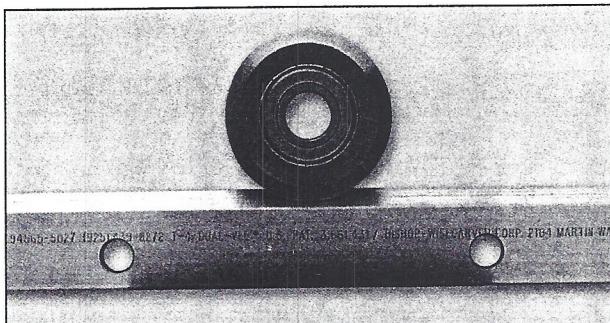
GENERAL INFORMATION

SYMMCO TYPICAL PROPERTIES (Sintered Bronze and Sintered Iron-Copper Materials)

Composition Percent	SYM1 Sintered Bronze	SYM2 Sintered Bronze - High Density	SYM77 Sintered Iron-Copper
Copper	87.5 - 90.5	87.5 - 90.5	18 - 22
Iron	1.0 Max.	1.0 Max.	Balance (a)
Lead	(a)	(a)	...
Carbon	1.75 Max.	1.75 Max.	...
(Graphite, Max.)
Tin	9.5 - 10.5	9.5 - 10.5	...
Zinc
Acid Insolubles
Total Other Elements	0.5 (a) Included in other elements	0.5 (a) Included in other elements	3.0 (a) Total of iron plus copper shall be 97% min.
:	:		
:			

PHYSICAL AND MECHANICAL PROPERTIES

Composition Percent	SYM1 Sintered Bronze	SYM2 Sintered Bronze - High Density	SYM77 Sintered Iron-Copper
Density (gm. per cu. cent.)	6.4 - 6.8	6.8 - 7.2	5.8 - 6.2
Porosity (% by vol.)	19 min.	12 min.	19 min.
"K" Strength Constant	26,500	30,500	40,000
Tensile Strength (p.s.i.)	14,000	16 - 18,000	22,000
Elongation (% per one inch)	1	2 - 3	1
Yield Strength in Comp. (psi)	11,000 .	15 - 20,000 .	22,000 .

Guide Wheels**Guide Wheel Dimensions and Materials**

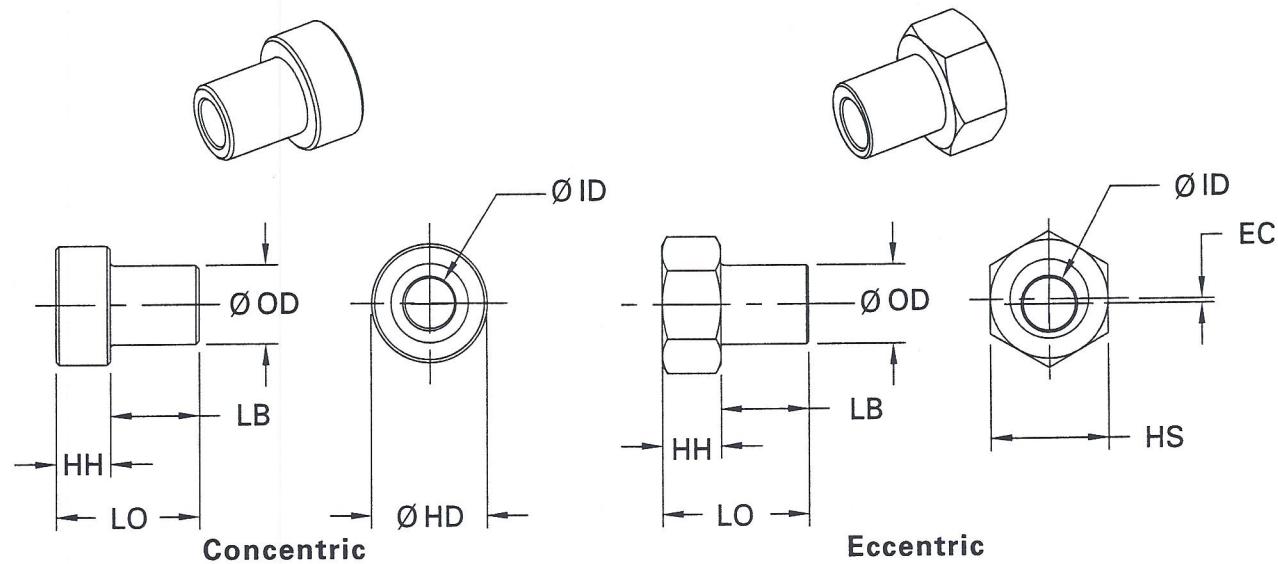
Part Number	Dimensions ^{3,11}						Materials					
	Outside Diameter	Bore Size	Width	Inside Vee Radius	Outside Vee Radius	Outer Race ⁸	Inner Race ⁹	Ball ⁸	Retainer ¹	Shield ¹	Seal ²	Grease ⁷
	A	B ^{4,5}	W ⁶	MDw Inside	MDw Outside							
W1	0.771	0.1875	0.310	0.313	0.468	52100	52100	52100	Nylon 66	A591	None	Alvania 2
W2	1.210	0.3750	0.438	0.500	0.719	52100	52100	52100	Nylon 66	A591	None	Alvania 2
W3	1.803	0.4724	0.625	0.750	1.063	52100	52100	52100	Nylon 66	A591	None	Alvania 2
W4	2.360	0.5906	0.750	1.000	1.375	52100	52100	52100	Nylon 66	A591	None	Alvania 2
W0X	0.584	0.1575	0.250	0.234	0.359	52100	52100	52100	304	A591	NBR	Alvania 2
W1X	0.771	0.1875	0.310	0.313	0.468	52100	52100	52100	Nylon 66	A591	NBR	Alvania 2
W2X	1.210	0.3750	0.438	0.500	0.719	52100	52100	52100	Nylon 66	A591	NBR	Alvania 2
W3X	1.803	0.4724	0.625	0.750	1.063	52100	52100	52100	Nylon 66	A591	NBR	Alvania 2
W4X	2.360	0.5906	0.750	1.000	1.375	52100	52100	52100	Nylon 66	A591	NBR	Alvania 2
W4XXL	2.968	0.8661	1.000	1.250	1.750	52100	52100	52100	Nylon 66	A591	NBR	Alvania 2
W1SSX	0.771	0.1875	0.310	0.313	0.468	440C	440C	440C	Nylon 66	304	NBR	Alvania 2
W2SSX	1.210	0.3750	0.438	0.500	0.719	440C	440C	440C	Nylon 66	304	NBR	Alvania 2
W3SSX	1.803	0.4724	0.625	0.750	1.063	440C	440C	440C	Nylon 66	304	NBR	Alvania 2
W4SSX	2.360	0.5906	0.750	1.000	1.375	440C	440C	440C	Nylon 66	304	NBR	Alvania 2
W4SSXXL	2.968	0.8661	1.000	1.250	1.750	440C	440C	440C	Nylon 66	304	NBR	Alvania 2
W0SSCR ¹⁰	0.584	0.1575	0.250	0.234	0.359	440C	440C	440C	304	304	None	Krytox227
W1SS227 ^{9,10}	0.771	0.1875	0.310	0.313	0.468	440C	440C	440C	304	304	None	Krytox227
W2SS227 ^{9,10}	1.210	0.3750	0.438	0.500	0.719	440C	440C	440C	304	304	None	Krytox227
W3SS227 ^{9,10}	1.803	0.4724	0.625	0.750	1.063	440C	440C	440C	304	304	None	Krytox227
W4SSCR ¹⁰	2.360	0.5906	0.750	1.000	1.375	440C	440C	440C	304	304	None	Krytox227

Notes:

- "A591" shield material (JIS SECC) is cold rolled carbon steel with electrolytic zinc coating (classified by ASTM A591). "304" reflects 304 stainless steel.
- "NBR" seal material is nitrile butadiene rubber.
- All dimensions in inches unless otherwise indicated.
- Bore ID tolerance is +.0000, -.0003 inch, except W4XL.
- W4XL Bore ID tolerance is +.0000, -.0004 inch.
- Width tolerance is +.0000, -.0047 inch.
- Krytox GPL 227 is a DuPont product. Alvania # 2 is a Shell Oil product.
- "52100" reflects hardened AISI 52100 bearing steel (Rc 60-62); "440C" reflects hardened AISI 440C stainless steel (Rc 58-60).
- High Temperature Compatible – Heat stabilized components allow for operating temperatures to 500°F.
- Clean Room Compatible – All stainless steel components are internally lubricated with Krytox GPL 227.
- Guide wheels are manufactured to ABEC class 5 tolerances.

Support Bushings

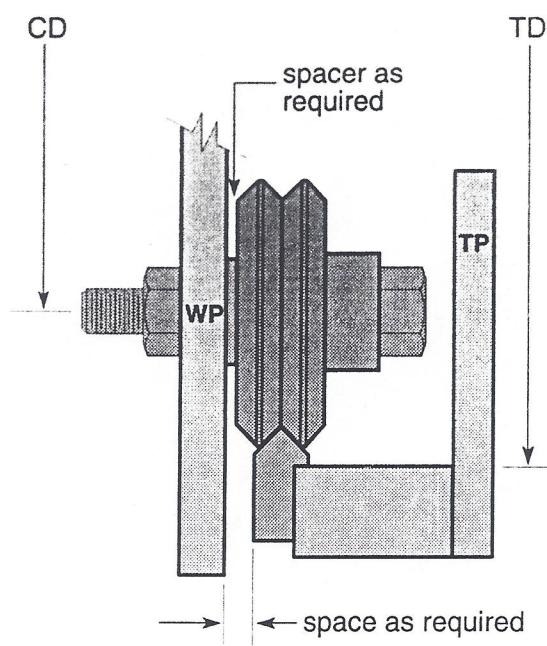
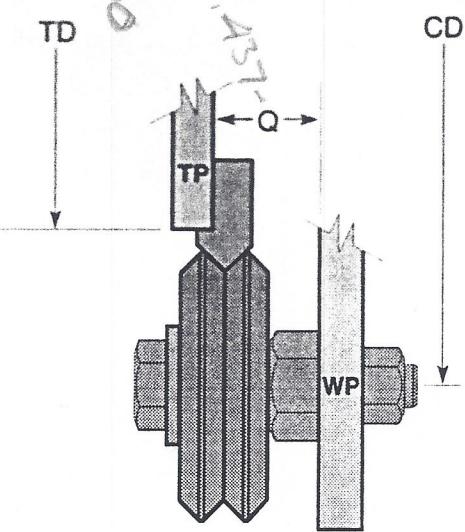
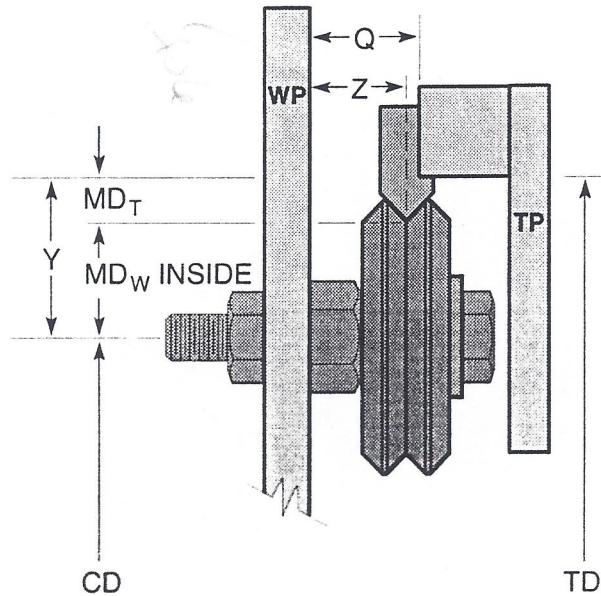
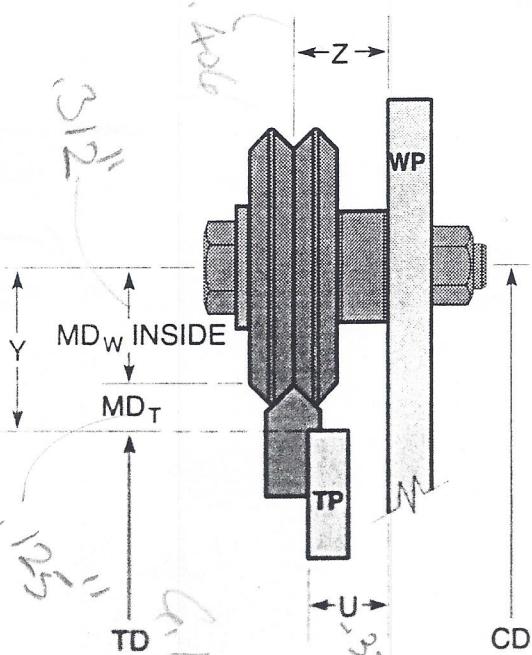
Standard Profile — INCH

**Support Bushings (Standard Profile — Inch) Dimensions**

Dual Vee Size	Part Number	Recommended Fastener Size	Hex Size	Offset	Head Height	Length Body	Length Overall	Outside Diameter	Inside Diameter	Head Diameter
			HS	EC	HH ⁷	LB	LO	OD ³	ID ⁸	HD
1	B1	# 6		—	0.250	0.300	0.550	0.1873	0.140	0.44
	BX1	# 6	7/16	0.012	0.250	0.300	0.550	0.1873	0.140	—
2	B2	1/4		—	0.281	0.425	0.706	0.3748	0.250	0.56
	BX2	1/4	9/16	0.024	0.281	0.425	0.706	0.3748	0.250	—
3	B3	5/16		—	0.375	0.615	0.990	0.4722	0.312	0.75
	BX3	5/16	3/4	0.042	0.375	0.615	0.990	0.4722	0.312	—
4	B4	3/8		—	0.437	0.740	1.177	0.5904	0.375	0.88
	BX4	3/8	7/8	0.060	0.437	0.740	1.177	0.5904	0.375	—
4XL	B4XL	9/16		—	0.565	0.990	1.555	0.8650	0.564	1.25
	BX4XL	9/16	1 1/4	0.060	0.565	0.990	1.555	0.8650	0.564	—

Notes:

1. All dimensions are in inches.
2. Standard materials are electroless nickel plated carbon steel or 303 stainless steel.
Add "-SS" to the end of the part number for stainless steel.
3. The bushing's outside diameter is designed to fit the corresponding size DualVee guide wheel.
Outside diameter (OD) tolerance is +0.000, -0.001.
4. Part # BX_ indicates eccentric (adjustable) bushing; rotation of eccentric allows fit up adjustment between track and guide wheels.
5. All mounting information within this catalog assumes a central position of the eccentric bushing, thus allowing wheel position adjustment from "+EC" to "-EC".
6. Part # B_ indicates concentric (stationary) bushing; Since concentrically mounted wheels have a fixed position, these bushings set the alignment of the carriage assembly to the rail. Concentrically mounted wheels should be configured to carry the majority of the load whenever possible.
7. Head height (HH) tolerance is ±0.001.
8. Inside diameter (ID) tolerance is +0.002, -0.000.



Outboard Mounting Formula

$$TD + 2Y = CD$$

Inboard Mounting Formula*

$$TD - 2Y = CD$$

*Where CD is less than wheel diameter, Guide Wheels must be offset for proper clearance.

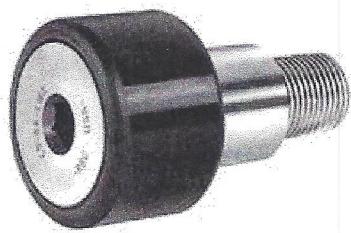


Cam Followers

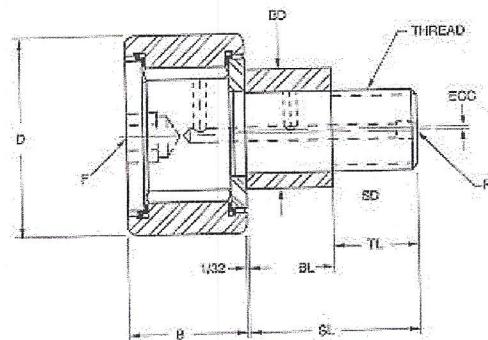
**Hexlube Cam Centric Adjustable
Cam Followers - Cylindrical and
Crowned O.D.**



1/2" \varnothing @
ROLLER
CASE



Pre-Installed
lube fitting in
hex head



Series S--LWX

11515
11516

RBC-S16LWX

700# LOAD

S16
LWX

RAIL GUIDE

Part Number	D +.000 -.001	BD +.001 -.000	Approx Weight	F Lube Fitting 2	Socket Head	Speed Limit [rpm]	Bearing Dynamic Capacity C [lbf]
S 16 LWX	0.5	0.25	0.025		36168	5000	700
S 18 LWX	0.5625	0.25	0.033		36168	5000	700
S 20 LWX	0.625	0.375	0.056		36168	5000	960
S 22 LWX	0.6875	0.375	0.059		36168	5000	960
S 24 LWX	0.75	0.5	0.088	36235	36235	5000	1600
S 28 LWX	0.875	0.5	0.11	36235	36235	5000	1600
S 32 LWX	1	0.625	0.18	36235	36164	4500	2100
S 36 LWX	1.125	0.625	0.21	36235	36164	4500	2100
S 40 LWX	1.25	0.687	0.32	36235	36164	3900	3800
S 44 LWX	1.375	0.687	0.37	36235	36164	3900	3800
S 48 LWX	1.5	0.875	0.57	36235	36296	3100	4600
S 52 LWX	1.625	0.875	0.67	36235	36296	3100	4600
S 56 LWX	1.75	1	0.92	36235	36296	2600	5800
S 60 LWX	1.875	1	1.01	36235	36296	2600	5800
S 64 LWX	2	1.187	1.46	36235	36357	2200	8700
S 72 LWX	2.25	1.187	1.75	36235	36357	2200	8700
S 80 LWX	2.5	1.375	2.7	36235	36162	2000	11600
S 88 LWX	2.75	1.375	3.05	36235	36162	2000	11600
S 96 LWX	3	1.75	4.46	36164	36288	1600	15400
S 104 LWX	3.25	1.75	5.17	36164	36288	1600	15400
S 112 LWX	3.5	1.812	6.65	36164	36288	1400	22100
S 128 LWX	4	2	8.22	36164	36223	1300	23300



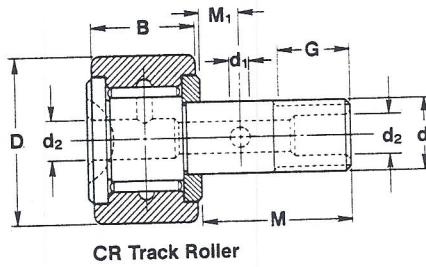
NEEDLE ROLLER TRACK ROLLERS

Regular Stud Type Track Rollers Types CR, CRS

CONSTRUCTION

The regular stud type track roller is a non-separable unit consisting of an outer ring, a full complement of needle rollers, stud, and a retaining washer securely fastened to the stud. A screwdriver slot in the head of the stud facilitates mounting. Cross-drilled holes in the stud raceway and shank, and an axially drilled hole through the stud, are provided for relubrication. The recessed axial hole accepts a standard nominal inch drive-type lubrication fitting. Plugs are supplied to close off unused lubrication fitting holes. Sources for lubrication fittings are available on request.

The seals on the type CRS track roller are located in counterbores of the outer ring and seal against the stud flange and the retaining washer, providing a good retention of lubricant and exclusion of foreign material. Sealed track rollers also have internal thrust washers made of self-lubricating resin.



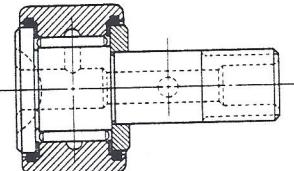
CR Track Roller

DIMENSIONS

Dimensions given below are for the unplated finished unit. Upon request, track rollers may be obtained with chrome plate on the rolling surface and sides of the outer ring, and cadmium plate on the other exposed surfaces, as mounted. When plated, the outer ring outside diameter is a maximum of 0.002" (0.051 mm) greater than listed.

Types CR and CRS track rollers are manufactured to inch nominal dimensions. Metric dimensions shown are for the convenience of the user. The controlling dimensions are in inches.

Tolerance limits for the outside diameters of the outer ring and the stud refer to the "single mean diameter" (the arithmetical mean of the largest and smallest diameters in a single radial plane).



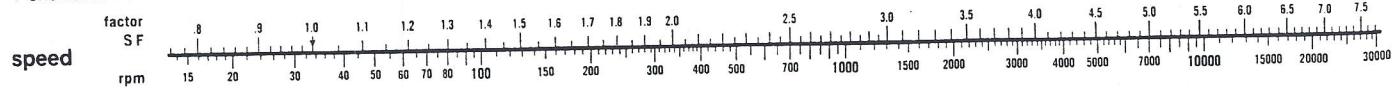
CRS Track Roller

Track Roller Designation with seals and internal thrust washers	Outside Diameter D	Stud Diameter d	Outer Ring Width B	Stud Length M (nominal)	Perfect Thread Length G minimum	Threads UNF	Cross Hole Location M_1	Cross Hole Diameter d_1	Grease Fitting Hole Diameter d_2				
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm			
CR-8	.500	12.700	.1900	.4326	.344	8.74	1/2 - 12	1/4	.64	1/8*	.32*		
CR-8-1	.500	12.700	.1900	.4326	.375	9.52	5/8 - 13	1/4	.64	1/8*	.32*		
CR-10	.625	15.575	.2500	.6350	.406	10.31	5/8 - 13	5/16	.79	1/4 - 28	1/8*	.32*	
CR-10-1	.625	15.575	.2500	.6350	.438	11.13	3/4 - 10	5/16	.79	1/4 - 28	1/8*	.32*	
CR-12	.750	19.050	.3750	.9325	.500	12.70	7/8 - 22	3/8	.95	3/8 - 24	1/4	.54	
CR-14	.875	22.225	.3750	.9325	.500	12.70	7/8 - 22	3/8	.95	3/8 - 24	1/4	.54	
CR-16	1.000	25.400	.4375	11.112	.625	15.88	1	25.4	1/2	12.7	7/16 - 20	1/4	.64
CR-18	1.125	28.575	.4375	11.112	.625	15.88	1	25.4	1/2	12.7	7/16 - 20	1/4	.64
CR-20	1.250	31.750	.5000	12.700	.750	19.05	1 1/4 - 13	3/8	15.9	1/2 - 20	5/16	.79	
CR-22	1.375	34.925	.5000	12.700	.750	19.05	1 1/4 - 13	3/8	15.9	1/2 - 20	5/16	.79	
CR-24	1.500	38.100	.6250	15.875	.875	22.22	1 1/2 - 18	3/4	19.0	5/8 - 18	3/8	.95	
CR-26	1.625	41.275	.6250	15.875	.875	22.22	1 1/2 - 18	3/4	19.0	5/8 - 18	3/8	.95	
CR-28	1.750	44.450	.7500	19.050	1.000	25.40	1 3/4 - 16	7/8	22.2	7/16 - 16	11.1	.54	
CR-30	1.875	47.625	.7500	19.050	1.000	25.40	1 3/4 - 16	7/8	22.2	7/16 - 16	11.1	.54	
CR-32	2.000	50.800	.8750	22.225	1.250	31.75	2	.50.8	1	25.4	7/8 - 14	1/2	.64
CR-36	2.250	57.150	.8750	22.225	1.250	31.75	2	.50.8	1	25.4	7/8 - 14	1/2	.64
CR-40	2.500	63.500	1.0000	25.400	1.500	38.10	2 1/4 - 14	57.2	1 1/8	1 - 14 \$	9/16	143	
CR-44	2.750	69.850	1.0000	25.400	1.500	38.10	2 1/4 - 14	57.2	1 1/8	1 - 14 \$	9/16	143	
CR-48	3.000	76.200	1.2500	31.750	1.750	44.45	2 1/2 - 12	63.5	1 1/4	31.8	1 1/4 - 12	5/8	15.9
CR-52	3.250	82.550	1.2500	31.750	1.750	44.45	2 1/2 - 12	63.5	1 1/4	31.8	1 1/4 - 12	5/8	15.9
CR-56	3.500	88.900	1.3750	34.925	2.000	50.80	2 3/4 - 12	69.8	1 9/8	34.9	1 9/8 - 12	11/16	17.5
CR-64	4.000	101.600	1.5000	39.100	2.250	57.15	3 1/2 - 12	88.9	1 1/2	38.1	1 1/2 - 12	3/4	19.0
	5.000	127.000											
	6.000	152.400											
	7.000	177.800											

These sizes are manufactured only with hexagonal wrench sockets in the stud head. See pages 394-395.

* No lubrication hole in threaded end.

§ UNS instead of UNF thread.



NEEDLE ROLLER TRACK ROLLERS



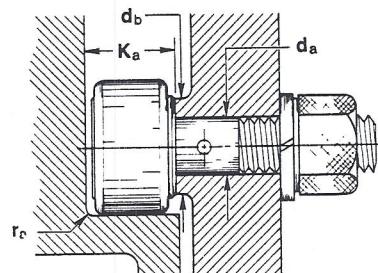
MOUNTING

In mounting stud type track rollers, a close fit between the stud and hole is desirable. Bore dimensions given below result in a fit varying from 0.0010" (0.025 mm) tight to 0.0005" (0.013 mm) loose.

The retaining washer should be firmly backed up by a flat housing shoulder perpendicular to the stud axis. To provide sufficient support for the retaining washer, the shoulder diameter should be at least as large as the minimum clamping diameter listed.

Stud track rollers may be mounted using either two thin lock nuts or one lock washer and one nut.

NOTE: Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.



LOAD RATINGS

The **T** symbol denotes Torrington Basic Dynamic Load Ratings which should be used in load-life calculations. The life nomograph is valid for loads up to $C_r / 4$. For loads in excess of $C_r / 4$, consult the Torrington Engineering Department for life predictions.

Working loads are based on stud strength and should not be exceeded by either static or dynamic applied loads.

Load ratings are given in pounds-force: 1lbf = 0.454 kgf = 4.448 N

EXAMPLE

A stud type track roller is required to operate at 1000 rpm under a load of 350 lbf for an L_{10} life of 2000 hours.

(a.) Unit selected must have Working Load Rating of at least 350 lbf.

(b.) The Basic Dynamic Load Rating (C_r) must be at least equal to $350 \cdot 4 = 1400$ lbf. See paragraph "basic load rating" on page 389.

(c.) Calculation: $C_r = \text{applied load} \cdot \text{speed factor} \cdot \text{life factor}$:

speed factor (SF) = 2.77 (see speed nomograph)

life factor (LF) = 1.52 (see life nomograph)

required $C_r = 350 \cdot 2.77 \cdot 1.52 = 1474$ lbf

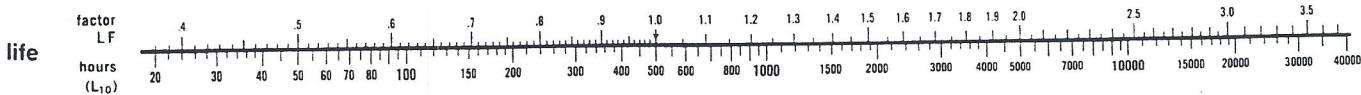
The CR-12 (or CRS-12) unit is the smallest track roller which will satisfy all the requirements:

Basic Load Rating = 1490 lbf — Working Load Rating = 1320 lbf

Track Roller Designation with seals and internal thrust washers	Bore Diameter for Stud da +0.0005 -0.0000	Fillet Radius ra maximum	Clamping Torque maximum	Mounting Overhang Space Ka minimum	Clamping Diameter db minimum	Basic Dynamic Load Rating Cr T ISO 281	Working Load ‡ maximum	Limiting Speed
	inch	mm	inch	mm	inch	mm	lb	rpm
CR-8 CRS-8	.1900	.4826	.010	.25	.8	.41	10.3	636 958 306 7500
CR-8-1 CRS-8-1	.1900	.4826	.010	.25	.8	.44	11.1	706 1060 306 7500
CR-10 CRS-10	.2500	.6350	.015	.38	20	.47	11.9	900 1360 562 5600
CR-10-1 CRS-10-1	.2500	.6350	.015	.38	20	.50	12.7	977 1470 562 5600
CR-12 CRS-12	.3750	.9525	.015	.38	55	.56	14.3	1490 2250 1320 3900
CR-14 CRS-14	.3750	.9525	.015	.38	55	.56	14.3	1490 2250 1320 3900
CR-16 CRS-16	.4375	.1110	.030	.76	150	.69	17.5	1880 2840 1730 3000
CR-18 CRS-18	.4375	.1112	.030	.76	150	.69	17.5	1880 2840 1730 3000
CR-20 CRS-20	.5000	.12700	.030	.76	205	.81	20.6	3140 4740 2280 2600
CR-22 CRS-22	.5000	.12700	.030	.76	205	.81	20.6	3140 4740 2280 2600
CR-24 CRS-24	.6250	.15875	.030	.76	390	.94	23.8	3690 5570 3620 2100
CR-26 CRS-26	.6250	.15875	.030	.76	390	.94	23.8	3690 5570 3620 2100
CR-28 CRS-28	.7500	.19050	.040	1.02	750	1.06	27.0	4710 7080 5290 1700
CR-30 CRS-30	.7500	.19050	.040	1.02	750	1.06	27.0	4710 7080 5290 1700
CR-32 CRS-32	.8750	.22225	.050	1.27	900	1.33	33.7	7060 10600 7280 1500
CR-36 CRS-36	.8750	.22225	.050	1.27	900	1.33	33.7	7060 10600 7280 1500
CR-40 CRS-40	1.0000	.25400	.090	2.29	1350	1.58	40.1	8940 13500 9560 1300
CR-44 CRS-44	1.0000	.25400	.090	2.29	1350	1.58	40.1	8940 13500 9560 1300
CR-48 CRS-48	1.2500	.31750	.090	2.29	2050	1.83	46.4	12900 19500 15200 1100
CR-52 CRS-52	1.2500	.31750	.090	2.29	2050	1.83	46.4	12900 19500 15200 1100
CR-56 CRS-56	1.3750	.34325	.090	2.29	2500	2.08	52.8	16900 25500 18500 990
CR-64 CRS-64	1.5000	.38100	.090	2.29	3000	2.33	59.1	21500 32400 22000 920

These sizes are manufactured only with hexagonal wrench sockets in the stud head. See pages 394-395.

‡ Maximum working load is based on strength of track roller stud.





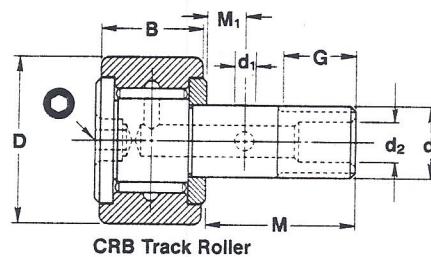
NEEDLE ROLLER TRACK ROLLERS

Regular Stud Type Track Rollers Types CRB, CRSB

CONSTRUCTION

The regular stud type track roller is a non-separable unit consisting of an outer ring, a full complement of needle rollers, stud, and a retaining washer securely fastened to the stud. A hexagonal wrench socket in the head of the stud facilitates mounting. Cross-drilled holes in the stud raceway and shank, and an axially drilled hole through the stud, are provided for relubrication. The recessed axial hole accepts a standard nominal inch drive-type lubrication fitting. Plugs are supplied to close off unused lubrication fitting holes. Sources for lubrication fittings are available on request.

The seals on the type CRSB track roller are located in counterbores of the outer ring and seal against the stud flange and the retaining washer, providing a good retention of lubricant and exclusion of foreign material. Sealed track rollers also have internal thrust washers made of self-lubricating resin.



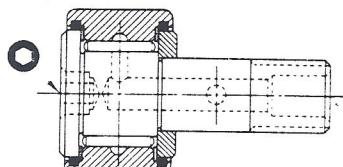
DIMENSIONS

Dimensions given below are for the unplated finished unit. Upon request, track rollers may be obtained with chrome plate on the rolling surface and sides of the outer ring, and cadmium plate on the other exposed surfaces, as mounted. When plated, the outer ring outside diameter is a maximum of 0.002" (0.051 mm) greater than listed.

Types CRB and CRSB track rollers are manufactured to inch nominal dimensions. Metric dimensions shown are for the convenience of the user. The controlling dimensions are in inches.

Tolerance limits for the outside diameters of the outer ring and the stud refer to the "single mean diameter" (the arithmetical mean of the largest and smallest diameters in a single radial plane.)

For hexagonal wrench sizes, see page 388.

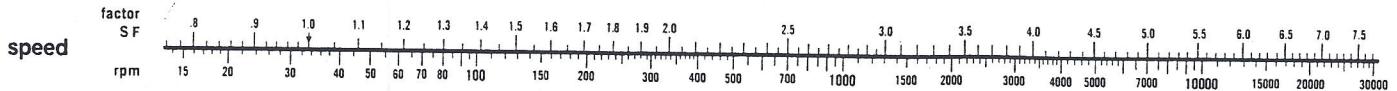


Track Roller Designation with seals and internal thrust washers	Outside Diameter D	Stud Diameter d	Outer Ring Width B	Stud Length M	Perfect Thread Length G	Threads UNF	Cross Hole Location M ₁	Cross Hole Diameter d ₁	Grease Fitting Hole Diameter d ₂
	inch mm	inch mm	inch mm	inch mm	inch mm			inch mm	inch mm
without seals	+0.000 -0.001	+0.000 -0.003	+0.0010 -0.0000	+0.025 -0.000	+0.000 -0.005	-0.00 -0.13	(nominal)	minimum	
CRB-8	.500	.12700	.1900	.426	.344	.874	1/2	.127	1/4 - 32
CRB-8-1	.500	.12700	.1900	.426	.375	.952	5/8	.138	10 - 32
CRB-10	.625	.15875	.2600	.6350	.406	.1031	5/8	.159	5/16 - 28
CRB-10-1	.625	.15875	.2500	.6350	.438	.1143	3/4	.130	1/4 - 28
CRB-12	.750	.19050	.3750	.925	.500	.1270	7/8	.122	3/8 - 24
CRB-14	.875	.22235	.3750	.925	.500	.1270	7/8	.122	3/8 - 24
CRB-16	1.000	.25400	.4375	1.112	.625	.1588	1	.154	1/2 - 20
CRB-18	1.125	.28575	.4375	1.112	.625	.1588	1	.154	1/2 - 20
CRB-20	1.250	.31750	.5000	1.2700	.750	.1905	1 1/4	.218	5/8 - 18
CRB-22	1.375	.34925	.5000	1.2700	.750	.1905	1 1/4	.218	5/8 - 18
CRB-24	1.500	.38100	.6250	1.5875	.875	.2222	1 1/2	.281	3/4 - 18
CRB-26	1.625	.41275	.6250	1.5875	.875	.2222	1 1/2	.281	3/4 - 18
CRB-28	1.750	.44450	.7500	1.9050	1.000	.2540	1 3/4	.344	7/8 - 22
CRB-30	1.875	.47625	.7500	1.9050	1.000	.2540	1 3/4	.344	7/8 - 22
CRB-32	2.000	.50800	.8750	2.225	1.250	.3175	2	.508	1 - 14
CRB-36	2.250	.57150	.8750	2.225	1.250	.3175	2	.598	1 - 14
CRB-40	2.500	.63500	1.0000	2.400	1.500	.3810	2 1/4	.572	1 1/8 - 28
CRB-44	2.750	.69850	1.0000	2.400	1.500	.3810	2 1/4	.572	1 1/8 - 28
•CRB-48	3.000	.76200	1.2500	3.1750	1.750	.4445	2 1/2	.635	1 1/4 - 12
•CRB-52	3.250	.82550	1.2500	3.1750	1.750	.4445	2 1/2	.635	1 1/4 - 12
•CRB-56	3.500	.88900	1.3750	3.4925	2.000	.5080	2 1/4	.698	13/8 - 24
•CRB-64	4.000	1.01600	1.5000	3.8100	2.250	.5715	3 1/2	.839	13/8 - 12
—	•CRS-B-80	5.000	12.7000	2.0000	5.000	2.750	69.85	5 1/16	128.6
—	•CRS-B-96	6.000	152.400	2.5000	63.500	3.250	82.55	6	152.4
—	•CRS-B-112	7.000	177.600	3.0000	76.200	3.750	95.25	7 1/16	195.3

§ UNS instead of UNF thread.

† UN instead of UNF thread.

• Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.



NEEDLE ROLLER TRACK ROLLERS



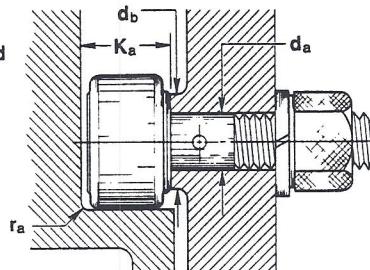
MOUNTING

In mounting stud type track rollers, a close fit between the stud and hole is desirable. Bore dimensions given below result in a fit varying from 0.0010" (0.025 mm) tight to 0.0005" (0.013 mm) loose.

The retaining washer should be firmly backed up by a flat housing shoulder perpendicular to the stud axis. To provide sufficient support for the retaining washer, the shoulder diameter should be at least as large as the minimum clamping diameter listed.

Stud track rollers may be mounted using either two thin lock nuts or one lock washer and one nut.

NOTE: Clamping torque is based on lubricated threads. If threads are dry, the torque values listed below may be doubled.



LOAD RATINGS

The **T** symbol denotes Torrington Basic Dynamic Load Ratings which should be used in load-life calculations without applying downrating application factors. The life nomograph is valid for loads up to $C_r / 4$. For loads in excess of $C_r / 4$, consult the Torrington Engineering Department for life predictions.

Working loads are based on stud strength and should not be exceeded by either static or dynamic applied loads.

Load ratings are given in pounds-force: 1lbf = 0.454 kgf = 4.448 N

EXAMPLE

A stud type track roller is required to operate at 1000 rpm under a load of 350 lbf for an L_{10} life of 2000 hours.

- (a.) Unit selected must have Working Load Rating of at least 350 lbf.
- (b.) The Basic Dynamic Load Rating (C_r) must be at least equal to $350 \cdot 4 = 1400$ lbf. See paragraph "basic load rating" on page 389.
- (c.) Calculation: $C_r = \text{applied load} \cdot \text{speed factor} \cdot \text{life factor}$:
speed factor (SF) = 2.77 (see speed nomograph)
life factor (LF) = 1.52 (see life nomograph)
required $C_r = 350 \cdot 2.77 \cdot 1.52 = 1474$ lbf

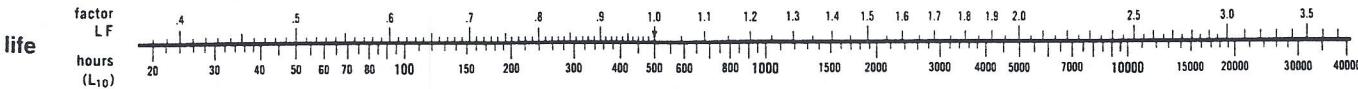
The CRB-12 (or CRSB-12) unit is the smallest track roller which will satisfy all the requirements:

Basic Load Rating = 1490 lbf — Working Load Rating = 1320 lbf

Track Roller Designation with seals and internal thrust washers	Bore Diameter for Stud da +0.0005 -0.0000	Fillet Radius r_a maximum inch mm	Clamping Torque maximum	Mounting Overhang Space K_a minimum	Clamping Diameter db minimum	T	Basic Dynamic Load Rating C_r ISO 281	Working Load ‡ maximum	Limiting Speed					
inch	mm	inch mm	lbf • in	inch	mm	inch	mm	lbf	lbf	lbf				
CRB-8	CRSB-8	.1900	4.826	.010	.025	.8	.41	10.3	19/64	7.5	636	958	306	7500
CRB-8-1	CRSB-8-1	.1900	4.826	.010	.025	8	.44	11.1	19/64	7.5	706	1060	306	7500
CRB-10	CRSB-10	.2500	6.350	.015	.035	20	.47	11.9	23/64	9.1	900	1360	562	5600
CRB-10-1	CRSB-10-1	.2500	6.350	.015	.036	20	.50	12.7	23/64	9.1	977	1470	562	5600
CRB-12	CRSB-12	.3750	9.525	.015	.038	55	.56	14.3	1/2	12.7	1490	2250	1320	3900
CRB-14	CRSB-14	.3750	9.525	.015	.038	55	.56	14.3	1/2	12.7	1490	2250	1320	3900
CRB-16	CRSB-16	.4375	11.112	.030	.076	150	.69	17.5	19/32	15.1	1880	2840	1730	3000
CRB-18	CRSB-18	.4375	11.112	.030	.076	150	.69	17.5	19/32	15.1	1880	2840	1730	3000
CRB-20	CRSB-20	.5000	12.700	.030	.076	205	.81	20.6	3/4	19.0	3140	4740	2280	2600
CRB-22	CRSB-22	.5000	12.700	.030	.076	205	.81	20.6	3/4	19.0	3140	4740	2280	2600
CRB-24	CRSB-24	.6250	15.875	.030	.076	390	.94	23.8	57/64	22.6	3690	5570	3620	2100
CRB-26	CRSB-26	.6250	15.875	.030	.076	390	.94	23.8	57/64	22.6	3690	5570	3620	2100
CRB-28	CRSB-28	.7500	19.050	.040	1.02	750	1.06	27.0	13/64	26.6	4710	7080	5290	1700
CRB-30	CRSB-30	.7500	19.050	.040	1.02	750	1.06	27.0	13/64	26.6	4710	7080	5290	1700
CRB-32	CRSB-32	.8750	22.225	.050	1.27	900	1.33	33.7	13/64	30.6	7060	10600	7280	1500
CRB-36	CRSB-36	.8750	22.225	.050	1.27	900	1.33	33.7	13/64	30.6	7060	10600	7280	1500
CRB-40	CRSB-40	1.0000	25.400	.090	2.29	1350	1.58	40.1	13/8	34.9	8940	13500	9560	1300
CRB-44	CRSB-44	1.0000	25.400	.090	2.29	1350	1.58	40.1	13/8	34.9	8940	13500	9560	1300
•CRB-48	•CRSB-48	1.2500	31.750	.090	2.29	2050	1.83	46.4	13/4	44.4	12900	19500	15200	1100
•CRB-52	•CRSB-52	1.2500	31.750	.090	2.29	2050	1.83	46.4	13/4	44.4	12900	19500	15200	1100
•CRB-56	•CRSB-56	1.3750	34.925	.090	2.29	2500	2.08	52.8	159/64	46.8	16900	25500	18500	990
•CRB-64	•CRSB-64	1.5000	38.100	.090	2.29	3000	2.33	59.1	29/32	57.9	21500	32400	22000	920
—	•CRSB-80	2.0000	50.866	.160	4.06	3000	2.88	73.0	31/4	62.6	33800	51000	40000	700
—	•CRSB-96	2.5000	63.500	.160	4.06	3000	3.38	85.7	329/32	93.2	48300	72800	62500	580
—	•CRSB-112	3.0000	76.200	.160	4.06	3000	3.88	99.4	49/16	115.9	65200	98200	90000	500

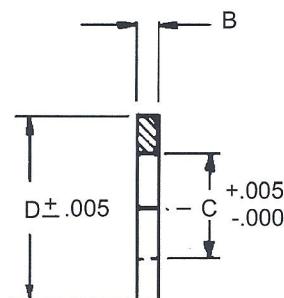
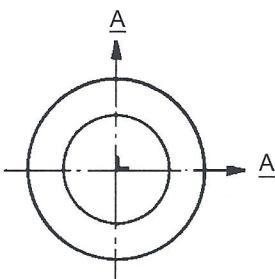
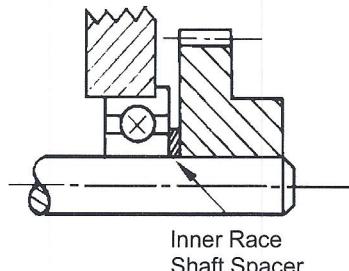
Maximum working load is based on strength of track roller stud.

• Furnished with lubrication hole in head end of stud and lubrication fitting installed below bottom of hex wrench socket.



Shaft Spacer

5/64" to 3/16" Shaft Size Inner Race
18-8 Stainless Steel or Anodized Aluminum



Sect. AA

STAINLESS STK. NO.	C	D	B	
SS1-49			.002	
SS1-1			.004	±.001
SS1-2			.006	
SS1-46			.008	
SS1-3	.078	.164	.010	
SS1-47			.012	±.002
SS1-48			.014	
SS1-4			.016	
SS1-50			.002	
SS1-5			.004	±.001
SS1-6			.006	
SS1-43	.093	.203	.008	
SS1-7			.010	
SS1-44			.012	±.002
SS1-45			.014	
SS1-8			.016	
SS1-51			.002	
SS1-9			.004	
SS1-10			.006	±.001
SS1-27			.008	
SS1-11	.125	.187	.010	
SS1-28			.012	±.002
SS1-29			.014	
SS1-12			.016	

STAINLESS STK. NO.	ALUM. STK. NO.	C	D	B	
SS1-13	SS1-13-A			.031	
SS1-14	SS1-14-A			.063	
SS1-30	SS1-30-A			.094	
SS1-15	SS1-15-A			.125	±.003
SS1-31	SS1-31-A			.188	
SS1-16	SS1-16-A			.250	
SS1-32	SS1-32-A			.375	
SS1-17	SS1-17-A			.500	
SS1-52				.002	
SS1-18				.004	±.001
SS1-19				.006	
SS1-36				.008	
SS1-20				.010	
SS1-37				.012	+.002
SS1-38				.014	
SS1-21				.016	
SS1-22	SS1-22-A	.187	.250	.031	
SS1-23	SS1-23-A			.063	
SS1-40	SS1-40-A			.094	
SS1-24	SS1-24-A			.125	±.003
SS1-41	SS1-41-A			.188	
SS1-25	SS1-25-A			.250	
SS1-42	SS1-42-A			.375	
SS1-26	SS1-26-A			.500	

STOCK NUMBER	DESCRIPTION
KIT-SS1	ST. STEEL, SHAFTSPACERS, INNER RACE, 1/8, 3/16", 1/4" SHAFTSIZE (330 PIECES)

Richard Nagy

From: "David H Dean" <ddean@as.arizona.edu>
To: "Richard Nagy" <rnagy@as.arizona.edu>
Cc: "David H Dean" <ddean@as.arizona.edu>
Sent: Tuesday, April 09, 2002 10:29 AM
Subject: Fw: Looking for

Looking for these washers, See below for part number

----- Original Message -----

From: "David H Dean" <ddean@as.arizona.edu>
To: <gwilliams@as.arizona.edu>
Cc: "Warren Davison" <wdavison@as.arizona.edu>; "E. Olszewski"
<edo@as.arizona.edu>; "Russ Warner" <rwarner@as.arizona.edu>; "David H
Dean" <ddean@as.arizona.edu>
Sent: Thursday, March 21, 2002 10:18 AM
Subject: Fw: Looking for

> Hi Grant,
>
> This is the Shim washer that we need for the Vee wheel offset for the
> filter wheel and center hub.
> They probably can be found locally and in fact there is no need to contact
> Berg. They are list in the berg
> catalog. We will need to get 6 time 4 plus 4 time 2 and to the factor of
> one billion, No 6 times 4 plus
> 4 times 2 should cover the shim washer need. You my want to wait on this
> tell the filter wheel ASM
> is through checking. I thinking that there my be a change in the Vee wheel
> contact area on the center hub.
> If we spec out a lower surface then on the filter wheel then shim up to
the
> filter wheel height.
> Due to machining we my not get a surface to surface match between the
filter
> wheel and center hub.
> So by calling out a lower surface it my work to our favor. Warren did you
> read this ?
> In short by calling out a lower surface on the center hub we my need less
> shim washers ordered.
>
>
> David Dean
> ----- Original Message -----
> From: "David H Dean" <ddean@as.arizona.edu>
> To: <wmbergtechsupport@wmberg.com>
> Sent: Thursday, February 28, 2002 5:42 AM
> Subject: Re: Looking for
>
>
>> Thanks I will
>> ----- Original Message -----
>> From: <wmbergtechsupport@wmberg.com>
>> To: "David H Dean" <ddean@as.arizona.edu>
>> Cc: <ellen.r.manuel@wmberg.com>; <anekwe.barrow@wmberg.com>
>> Sent: Wednesday, February 27, 2002 3:05 PM
>> Subject: Re: Looking for
>>
>>
>>>
>>>

>>> I think the part you are looking for is an SS1-20. The dimensions
> you
>>> gave fall into the tolerance range for this piece. Go to wmburg.com
and
>>> open the on-line catalog. Put in that part number and the catalog page
>> that
>>> shows the part should come up.
>>>
>>> Hope this helped.

>>>
>>>
>>> HLP

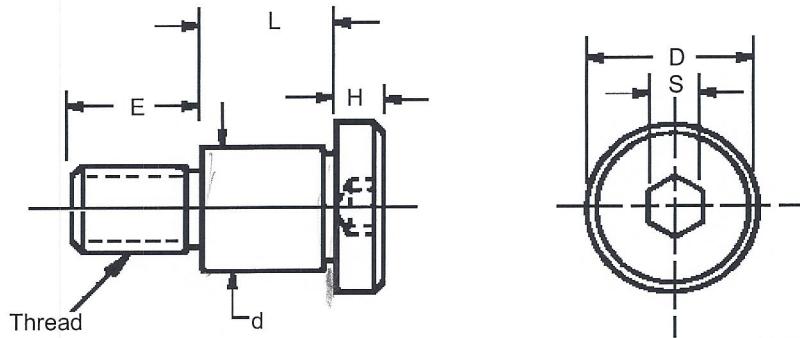
>>>
>>>
>>>
>>>
>>>
>>> "David H
>>> Dean" To:
>><WMBergTechSupport@wmburg.com>
>>> <ddean@as.ari cc: "Warren Davison"
>>> zona.edu> <wdavison@as.arizona.edu>,
> "David
>> H Dean"
>>>
>>> 02/27/02 <ddean@as.arizona.edu>
>>> 04:23 PM Subject: Looking for

>>>
>>> Hi Berg,
>>>
>>> I am looking for a shim washer with I think has the part number
SSI20
>> or
>>> SS120.
>>> This stock number is from a old parts bag that we had in stock.
>>> I did not find this in one of your old catalog that I have. Here are
> the
>>> spec.'s.
>>>
>>> It has about a .246 O.D. .188 I.D. and is .012" thick. Please
contact
>> me
>>> on this item.
>>> It is more important for us to control the thickness then the O.D. and
>> I.D.
>>>
>>> Thanks
>>>
>>> David Dean
>>> Design Coordinator
>>> Steward Observatory U of A
>>> 933 N Cherry Ave
>>> Tucson, AZ 85721
>>>
>>>
>>>

Shoulder Screws

Hex Socket Head

303 Stainless Steel and 416 Stainless Steel Hardened RC 26-36



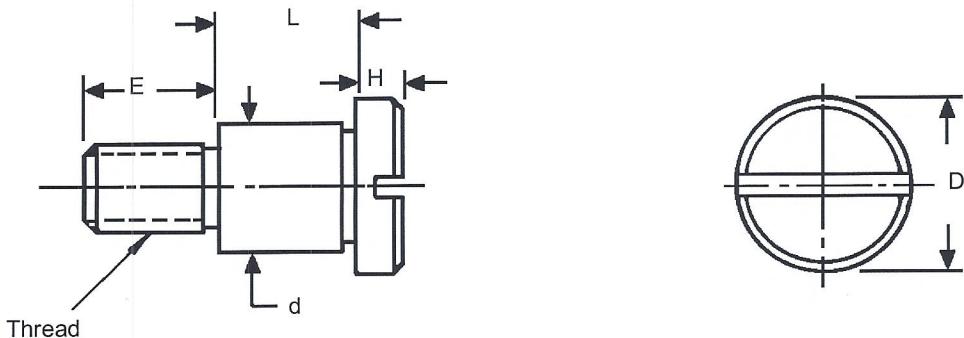
416 STAINLESS ST. HARDENED RC 26-36	303 STAINLESS STEEL							
STOCK NUMBER	STOCK NUMBER	THREAD	d +.000 -.001	L +.002 -.000	D	H	E	S
PZ-1	PZ-1-3			.1255				
PZ-2	PZ-2-3			.1880				
PZ-3	PZ-3-3	#4-40	.1245	.2505	1/4	1/8	5/32	5/64
PZ-4	PZ-4-3			.3130				
PZ-5	PZ-5-3	UNC-2A		.3755				
PZ-6	PZ-6-3			.1255				
PZ-7	PZ-7-3			.1880				
PZ-8	PZ-8-3			.2505				
PZ-9	PZ-9-3			.3130				
PZ-10	PZ-10-3	#8-32		.3755				
PZ-11	PZ-11-3			.5005				
PZ-12	PZ-12-3			.6255				
PZ-13	PZ-13-3			.7505				
PZ-14	PZ-14-3			1.0005				
PZ-15	PZ-15-3			1.2505				
PZ-16	PZ-16-3			1.5005				
PZ-17	PZ-17-3			.1255				
PZ-18	PZ-18-3			.1880				
PZ-19	PZ-19-3			.2505				
PZ-20	PZ-20-3			.3130				
PZ-21	PZ-21-3	#10-32	.2495	.3755				
PZ-22	PZ-22-3	UNF-2A		.5005				
PZ-23	PZ-23-3			.6255				
PZ-24	PZ-24-3			.7505				
PZ-25	PZ-25-3			1.0005				
PZ-26	PZ-26-3			1.2505				
PZ-27	PZ-27-3			1.5005				

See page F13 for hex wrenches

Shoulder Screws

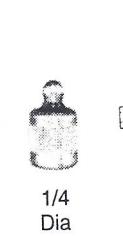
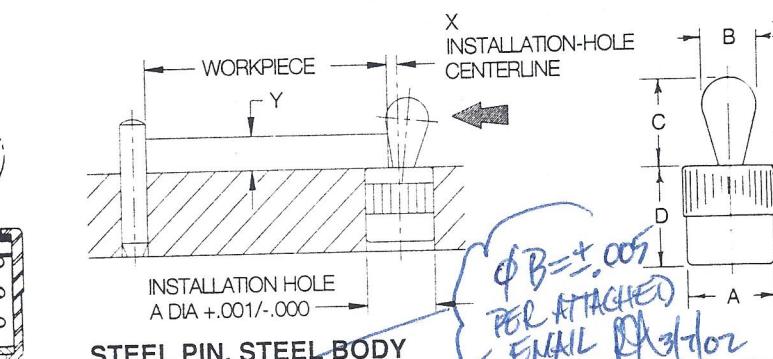
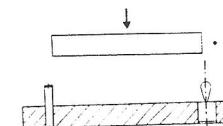
Slotted Head

303 Stainless Steel and 416 Stainless Steel Hardened RC 26-36



416 STAINLESS ST HARDENED RC 26-36	303 STAINLESS STEEL						
STOCK NUMBER	STOCK NUMBER	THREAD	d +.000 -.001	L +.002 -.000	D	H	E
PL-1	PL-1-3			.1255			
PL-2	PL-2-3			.1880			
PL-3	PL-3-3	#4-40	.1245	.2505	1/4	1/8	5/32
PL-4	PL-4-3			.3130			
PL-5	PL-5-3	UNC-2A		.3755			
PL-6	PL-6-3			.1255			
PL-7	PL-7-3			.1880			
PL-8	PL-8-3			.2505			
PL-9	PL-9-3			.3130			
PL-10	PL-10-3	#8-32		.3755			
PL-11	PL-11-3	UNC-2A	.1870	.5005	5/16	5/32	3/16
PL-12	PL-12-3			.6255			
PL-13	PL-13-3			.7505			
PL-14	PL-14-3			1.0005			
PL-15	PL-15-3			1.2505			
PL-16	PL-16-3			1.5005			
PL-17	PL-17-3			.1255			
PL-18	PL-18-3			.1880			
PL-19	PL-19-3			.2505			
PL-20	PL-20-3			.3130			
PL-21	PL-21-3	#10-32		.3755			
PL-22	PL-22-3	UNF-2A	.2495	.5005	3/8	3/16	1/4
PL-23	PL-23-3			.6255			
PL-24	PL-24-3			.7505			
PL-25	PL-25-3			1.0005			
PL-26	PL-26-3			1.2505			
PL-27	PL-27-3			1.5005			

SPRING LOCATING PINS

5/8
Dia1/2
Dia7/16
Dia7/16
Dia1/4
Dia

Our patented Spring Locating Pins are an extremely compact way to apply side force to a workpiece. The tapered contact pin is securely anchored in a spring base. Unit installs easily in a drilled hole. Available in five sizes, each in light, medium, or heavy force. Choice of steel, stainless steel, or polyurethane contact pin. Note: The above catalog photos are actual size.


**Steel Pin
Steel Body
(with Spring)**

Most popular version, with a durable case-hardened steel contact pin and steel body containing a coil spring. Protective rubber seal around contact pin keeps out chips and coolant. This type allows the most part-size variation.

PART NO.	A DIA	APPROX SIDE FORCE (LBS)	ALLOWABLE WORKPIECE TOLERANCE	X DIMENSION WHEN Y EQUALS								7/16 OR MORE
				B DIA	C	D	1/16	1/8	3/16	1/4	5/16	
CL-4-SLP-1	.250	2.2	.020	.118	.158	.295	.022	.024	.024	.024	.024	.024
CL-4-SLP-2		4.5										
CL-4-SLP-3		9										
CL-7-SLP-1		4.5										
CL-7-SLP-2	.438	11.2	.031	.197	.236	.452	—	.055	.055	.055	.055	.055
CL-7-SLP-3		22.5										
CL-7A-SLP-1		9										
CL-7A-SLP-2	.438	17	.039	.236	.394	.452	—	—	.049	.059	.059	.059
CL-7A-SLP-3		34										
CL-8-SLP-1		11.2										
CL-8-SLP-2	.500	22.5	.051	.315	.512	.532	—	—	—	.077	.087	.087
CL-8-SLP-3		45										
CL-10-SLP-1		22.5										
CL-10-SLP-2	.625	45	.063	.394	.630	.689	—	—	—	—	.098	.107
CL-10-SLP-3		67.5										.110

STAINLESS STEEL PIN, POLYURETHANE BODY


**Stainless Steel
Pin
Polyurethane
Body**

Stainless steel contact pin is ideal for corrosive environments and hygienic applications. Solid polyurethane body is covered by an aluminum shell.

CL-4-SLPS-1	.250	2.2	.008	.118	.158	.295	.022	.024	.024	.024	.024	.024
CL-4-SLPS-2		4.5										
CL-7-SLPS-1		6.7										
CL-7-SLPS-2	.438	13.5	.016	.197	.236	.433	—	.055	.055	.055	.055	.055
CL-7-SLPS-3		20.2										
CL-7A-SLPS-1		6.7										
CL-7A-SLPS-2	.438	13.5	.016	.236	.394	.433	—	—	.049	.059	.059	.059
CL-7A-SLPS-3		20.2										
CL-8-SLPS-1		11.2										
CL-8-SLPS-2	.500	22.5	.024	.315	.512	.512	—	—	—	.077	.087	.087
CL-8-SLPS-3		33.7										
CL-10-SLPS-1		22.5										
CL-10-SLPS-2	.625	45	.031	.394	.630	.689	—	—	—	—	.098	.107
CL-10-SLPS-3		67.5										.110

POLYURETHANE PIN, POLYURETHANE BODY


**Polyurethane
Pin
Polyurethane
Body**

Polyurethane contact pin avoids marring soft or finished surfaces. Solid polyurethane body is covered by an aluminum shell.

CL-4-SLPP-1	.250	2.2	.008	.118	.158	.295	.022	.024	.024	.024	.024	.024
CL-4-SLPP-2		4.5										
CL-7-SLPP-1	.438	6.7	.016	.197	.236	.433	—	.055	.055	.055	.055	.055
CL-7-SLPP-2		13.5										
CL-7A-SLPP-1	.438	6.7	.016	.236	.394	.433	—	—	.049	.059	.059	.059
CL-7A-SLPP-2		13.5										
CL-8-SLPP-1	.500	11.2	.024	.315	.512	.512	—	—	—	.077	.087	.087
CL-8-SLPP-2		22.5										
CL-10-SLPP-1	.625	22.5	.031	.394	.630	.689	—	—	—	—	.098	.107
CL-10-SLPP-2		45										.110


Carr Lane MANUFACTURING CO.

4200 Carr Lane Ct., P.O. Box 191970

St. Louis, Missouri 63119-2196

Phone: 314-647-6200, FAX: 314-647-5736

Richard Nagy

From: "Rich Cummines" <cumminr@carrlane.com>
To: <rnaty@as.arizona.edu>
Sent: Thursday, March 07, 2002 1:16 PM
Subject: RE: Technical assistance request 1502
Should be within .005 of published diameter

-----Original Message-----

From: rnaty@as.arizona.edu [mailto:rnaty@as.arizona.edu]
Sent: Thursday, March 07, 2002 12:36 PM
To: techassist@carrlane.com
Subject: Technical assistance request 1502

Technical assistance request 1502 ...

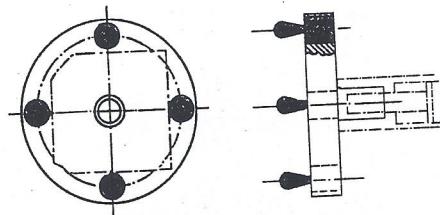
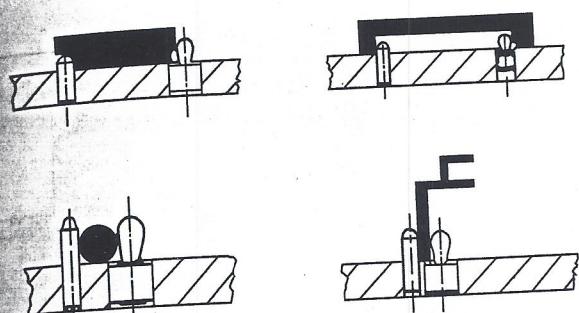
Name: Richard Nagy
Company: Steward Observatory, Univ. of Arizona
Email: rnaty@as.arizona.edu
Phone: 520-621-9495
Product Family: TOOLING COMPONENTS
Product: CL-4-SLPS-2

Hello,
Dia. B = .118; any tolerance or is this max. ?
Thank you.

I like the website, it's easy to navigate.

SPRING LOCATING PINS

APPLICATION EXAMPLES

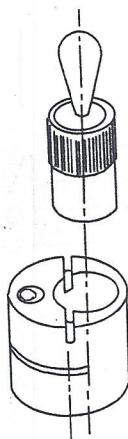


Can also be used as a gripper
for light clamping.



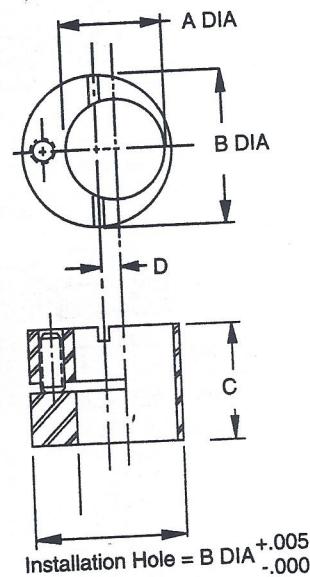
Eccentric Liners

Eccentric Liners provide additional adjustment for workpieces with looser tolerances. Steel.



ECCENTRIC LINERS

PART NO.	FITS THESE PINS	A DIA.		B DIA.		C	D
		NOMINAL	ACTUAL	NOMINAL	ACTUAL		
CL-4-SLPE	CL-4-SLP-x	1/4	.2500	1/2	.5000	.390	.079
	CL-4-SLPS-x		.2507		.4983		
	CL-4-SLPP-x						
CL-6-SLPE		3/8	.3750	5/8	.6250	.469	.079
			.3761		.6233		
CL-7-SLPE	CL-7-SLP-x	7/16	.4375 .4386	11/16	.6875 .6858	.469	.079
	CL-7-SLPS-x						
	CL-7-SLPP-x						
	CL-7A-SLP-x						
	CL-7A-SLPS-x						
	CL-7A-SLPP-x						
CL-8-SLPE	CL-8-SLP-x	1/2	.5000 .5011	3/4	.7500 .7480	.547	.079
	CL-8-SLPS-x						
	CL-8-SLPP-x						
CL-10-SLPE	CL-10-SLP-x	5/8	.6250 .6261	1	1.0000 .9980	.705	.118
	CL-10-SLPS-x						
	CL-10-SLPP-x						

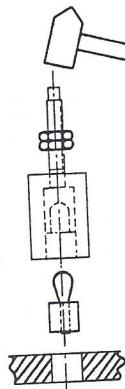


Installation Tools

INSTALLATION TOOLS

PART NO.	USE TO INSTALL		
	CL-4-SLP-x	CL-4-SLPS-x	CL-4-SLPP-x
CL-7-SLPT	CL-7-SLP-x	CL-7-SLPS-x	CL-7-SLPP-x
CL-7A-SLPT	CL-7A-SLP-x	CL-7A-SLPS-x	CL-7A-SLPP-x
CL-8-SLPT	CL-8-SLP-x	CL-8-SLPS-x	CL-8-SLPP-x
CL-10-SLPT	CL-10-SLP-x	CL-10-SLPS-x	CL-10-SLPP-x

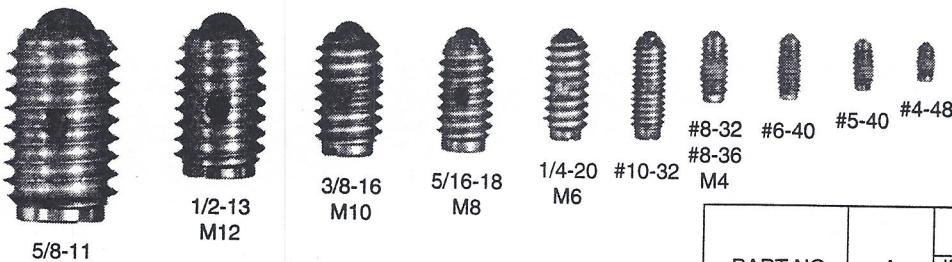
Handy tool to speed up installation of Spring Locating Pins. Use with any of the three types.



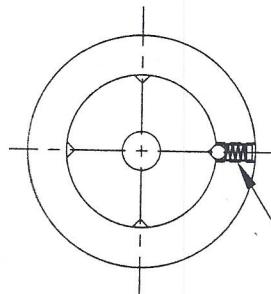
MANUFACTURING CO.
4200 Carr Lane Cl., P.O. Box 191970
St. Louis, Missouri 63119-2196
Phone: 314-647-6200, FAX: 314-647-5736

BALL PLUNGERS

BODY: 12L14 STEEL, ZINC PLATED OR BLACK OXIDE FINISH. LOCKING ELEMENT: NYLON 101
 BALL: 440C STAINLESS STEEL. SPRING: MUSIC WIRE



Self-contained ball-and-spring device available in many sizes and forces. Choice of light, medium, or heavy force in most thread sizes. 440C stainless steel ball (see page 57 for Delrin® balls). Install and/or adjust from either end. Note: The smallest three sizes (#4-48, #5-40, and #6-40) have no slot on the ball end. The smallest five sizes (#4-48, #5-40, #6-40, #8-32, and #8-36) are made of 300-series stainless steel. Locking element holds the unit securely in place after installation. Note: Catalog photos are actual size.

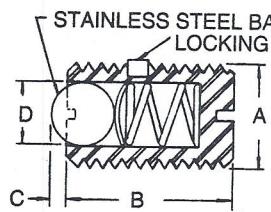


YES *

1

PWNGERS USED IN STATION BLOCKS TO HOLD FILTER HOLDER

FILTER
HOLDER
ON SIDE
LIMITE



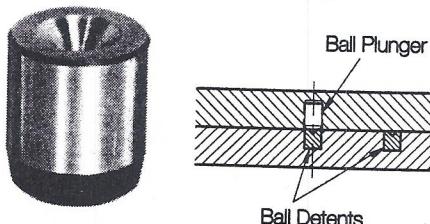
PART NO.	A	END FORCE (LBS)		B	C	D DIA
		INITIAL	FINAL			
CL-5-BP-1	#4-48	1/8	1/2	3/16	.020	.062
CL-10-BP-1	#5-40	1/4	3/4	1/4		
CL-15-BP-1	#6-40	1/2	1	5/16	.023	.078
CL-22-BP-1	#8-32	1/2	1-1/4	11/32	.025	.093
CL-20-BP-1	#8-36	1/2	1-1/2			
CL-30-BP-1		1-1/2	3	33/64	.025	.093
CL-30-BP-2	#10-32	2	5			
CL-30-BP-3		2	4			
CL-40-BP-1		3	7	17/32	.035	.125
CL-40-BP-2	1/4-20	4	12			
CL-40-BP-3		2	4-1/2			
CL-50-BP-1		4	9	37/64	.040	.156
CL-50-BP-2	5/16-18	6	17			
CL-50-BP-3		2-1/2	5			
CL-60-BP-1		5	10	5/8	.048	.187
CL-60-BP-2	3/8-16	6	21			
CL-60-BP-3		3	6			
CL-70-BP-1		6	12	3/4	.072	.281
CL-70-BP-2	1/2-13	6	30			
CL-70-BP-3		4-1/2	9			
CL-80-BP-1		9	18	63/64	.096	.375
CL-80-BP-2	5/8-11	7	50			
CL-80-BP-3						

METRIC

CLM-4-BP-1	M4	0.6	1.1	.354	.024	.098
CLM-6-BP-2	M6	0.6	1.5			
CLM-6-BP-1		1.5	2.9	.512	.024	.098
CLM-6-BP-3		3.9	8.8			
CLM-8-BP-2	M8	2.2	4.4			
CLM-8-BP-1		3.9	8.8	.591	.039	.157
CLM-8-BP-3		6.1	17.1			
CLM-10-BP-2	M10	2.5	5.0			
CLM-10-BP-1		5.0	9.9	.630	.047	.197
CLM-10-BP-3		6.1	20.9			
CLM-12-BP-2	M12	3.0	6.1			
CLM-12-BP-1		6.1	12.1	.787	.071	.276
CLM-12-BP-3		6.1	29.7			

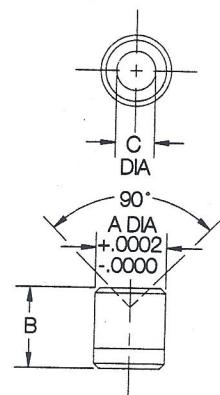
BALL DETENTS

440C STAINLESS STEEL, HEAT TREATED



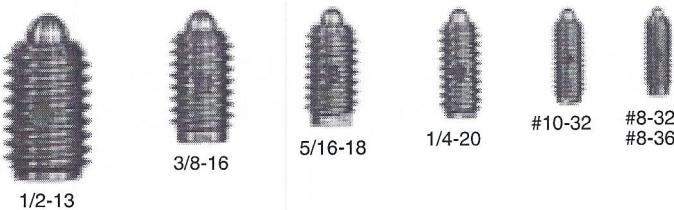
Press-in ball detent that provides a perfect-size mating hole for a ball plunger. Prevents wear due to side loads.

PART NO.	FOR BALL PLUNGER	A DIA	B	C DIA
CL-1-BD	#4-48, #5-40	.1075	1/8	.056
CL-2-BD	#6-40	.1175	1/8	.061
CL-3-BD	#8-32, #8-36, #10-32, M4, M6	.1614	3/16	.082
CL-4-BD	1/4-20	.2034	1/4	.111
CL-5-BD	5/16-18, M8	.2659	5/16	.139
CL-6-BD	3/8-16, M10	.3284	3/8	.164
CL-8-BD	1/2-13, M12	.4378	1/2	.241
CL-10-BD	5/8-11	.5472	5/8	.330



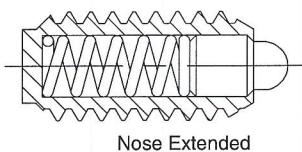
STAINLESS SHORT SPRING PLUNGERS

NOSE: 300-SERIES STAINLESS STEEL, (OR DELRIN®)
BODY: 300-SERIES STAINLESS STEEL. LOCKING ELEMENT: NYLON 101. SPRING: 302 STAINLESS STEEL



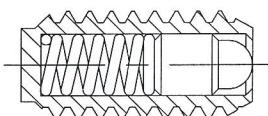
**NEW
#8-32
SIZES!**

Stainless steel version of the short spring plungers on page 80, for extra corrosion resistance. Self-contained plunger-and-spring device available in many sizes and forces. Choice of light or heavy force in each thread size. Available with a stainless steel nose, or a Delrin® nose to prevent marring. Install and/or adjust from either end. Locking element holds the unit securely in place after installation. Note: Catalog photos are actual size.



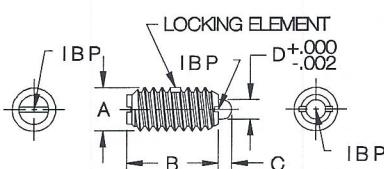
Nose Extended

USED IN
DRIVE CYCLE
DRAFT
4/11/02



Nose Retracted

SSPS	SSPN
P	P
E	E
21SSPS1	21SSPN1



**NEW
DELRIN®
SIZES!**

STAINLESS STEEL NOSE, HEAVY FORCE (USA)

PART NO.	A	END FORCE (LBS)		B	C	D DIA	NOSE
		INITIAL	FINAL				
CL-21-SSPS-1	#8-32	1.5	4.75	7/16	.052	.070	PLAIN
CL-22-SSPS-1	#8-36						
CL-31-SSPS-1	#10-32	1.75	6.25	15/32	.065	.093	
CL-43-SSPS-1	1/4-20	3	10.5	17/32	.078	.119	
CL-51-SSPS-1	5/16-18	3.75	15.5	9/16	.084	.135	
CL-61-SSPS-1	3/8-16	4.5	18.5	5/8	.110	.186	
CL-71-SSPS-1	1/2-13	5	28	3/4	.151	.248	

STAINLESS STEEL NOSE, LIGHT FORCE (USA)

PART NO.	A	END FORCE (LBS)		B	C	D DIA	NOSE
		INITIAL	FINAL				
CL-21-SSPS-2	#8-32	0.5	1.5	7/16	.052	.070	PLAIN
CL-22-SSPS-2	#8-36						
CL-31-SSPS-2	#10-32	.75	2.5	15/32	.065	.093	
CL-43-SSPS-2	1/4-20	1	3.5	17/32	.078	.119	
CL-51-SSPS-2	5/16-18	1.5	4	9/16	.084	.135	
CL-61-SSPS-2	3/8-16	1.5	5	5/8	.110	.186	
CL-71-SSPS-2	1/2-13	1.75	5.5	3/4	.151	.248	

DELRIN® NOSE, HEAVY FORCE (USA)

PART NO.	A	END FORCE (LBS)		B	C	D DIA	NOSE
		INITIAL	FINAL				
CL-21-SSPN-1	#8-32	1.5	4.75	7/16	.052	.070	BROWN
CL-22-SSPN-1	#8-36						
CL-31-SSPN-1	#10-32	1.75	6.25	15/32	.065	.093	
CL-43-SSPN-1	1/4-20	3	10.5	17/32	.078	.119	
CL-51-SSPN-1	5/16-18	3.75	15.5	9/16	.084	.135	
CL-61-SSPN-1	3/8-16	4.5	18.5	5/8	.110	.186	
CL-71-SSPN-1	1/2-13	5	28	3/4	.151	.248	

DELRIN® NOSE, LIGHT FORCE (USA)

PART NO.	A	END FORCE (LBS)		B	C	D DIA	NOSE
		INITIAL	FINAL				
CL-21-SSPN-2	#8-32	0.5	1.5	7/16	.052	.070	WHITE
CL-22-SSPN-2	#8-36						
CL-31-SSPN-2	#10-32	0.75	2.5	15/32	.065	.093	
CL-43-SSPN-2	1/4-20	1	3.5	17/32	.078	.119	
CL-51-SSPN-2	5/16-18	1.5	4	9/16	.084	.135	
CL-61-SSPN-2	3/8-16	1.5	5	5/8	.110	.186	
CL-71-SSPN-2	1/2-13	1.75	5.5	3/4	.151	.248	



CARR LANE MANUFACTURING CO.
4200 Carr Lane Ct., P.O. Box 191970
St. Louis, Missouri 63119-7970 USA
Phone: 314-647-6200, FAX: 314-647-5736
Web Site: www.carrlane.com

Spring Plungers & Plunger Wrenches

See page 2018 for an index of tooling and fixturing products.

Spring Plungers

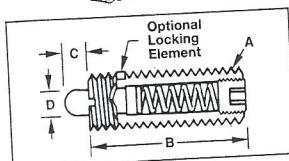
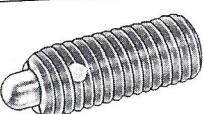
Spring Plungers
The large bearing surface and long travel on these spring plungers prevent binding and ensure exact plunger alignment. Excellent for locking, supporting, and locating workpieces and fixture parts. Choose from a variety of end forces to suit your application. End force increases as the nose is depressed.

Standard size plungers have a hex drive in the rear for use with a wrench.

Short size plungers combine the short body of a ball plunger with the long nose of a spring plunger. A slot in the rear allows installation using a screwdriver or plunger wrench. Available in inch and metric sizes.

Steel plungers are available with a heat-treated steel nose and with a Delrin nose. **Stainless steel plungers** are available with a stainless steel nose and with a Delrin nose. Models with a Delrin nose will damage soft, easily marred material.

To Order All spring plungers are available with and without a nylon locking element that resists vibration (except those marked with a \bullet , which are only available with a locking element). Please specify whether or not you want the plunger with or without a locking element.



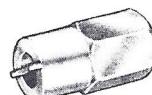
- Only available with a nylon locking element. ■ Nose is not heat treated.

Nose diameter is 0.119".

Ball and Spring Plunger Wrenches

Specially designed for installing and removing ball and spring plungers. Unlike screwdrivers, these wrenches won't damage springs or cause overloading.

Thread Size	Each	Thread Size	Each
#6	\$4.23	$\frac{3}{16}$ " and M10	\$5.11
#8 and M4	4.35	$\frac{1}{2}$ " and M12	5.99
#10 and M5	4.46	$\frac{5}{16}$ "	6.72
$\frac{1}{4}$ " and M6	4.59	$\frac{3}{8}$ "	7.49
$\frac{5}{16}$ " and M8	4.77	1"	8.01





1990 Russell Avenue
Santa Clara, CA 95054
(408) 919-0200
(408)-919-0201 Fax

Fax

To: Bob Nagel From: Ryan Lin x 214

Fax: 520-621-3398 Pages: 2

Phone: Date: November 20, 2001

Re: Nut for lead screw CC:

Urgent For Review Please Comment Please Reply Please Recycle

Bob,

Attached are the dimensions for the nut provided with the lead screw.

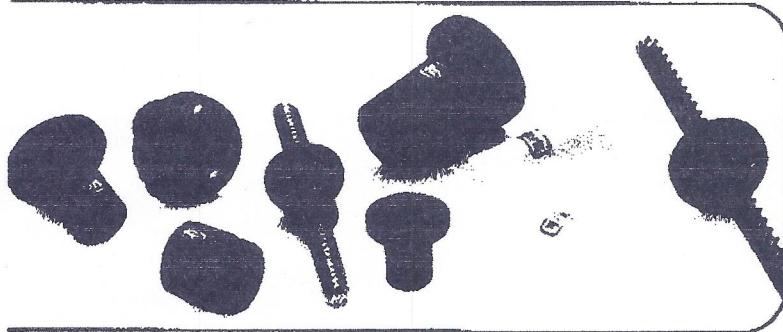
Regards,

Ryan

CC: Chris Miller / Flexible Technologies

B S E R I E S**B SERIES GENERAL PURPOSE LEAD SCREW ASSEMBLIES**

The Kerk B Series general purpose assembly is for applications not requiring anti-backlash and wear compensation. It provides effective power transmission at minimum cost, and features long life, self-lubricating polyacetal nuts.



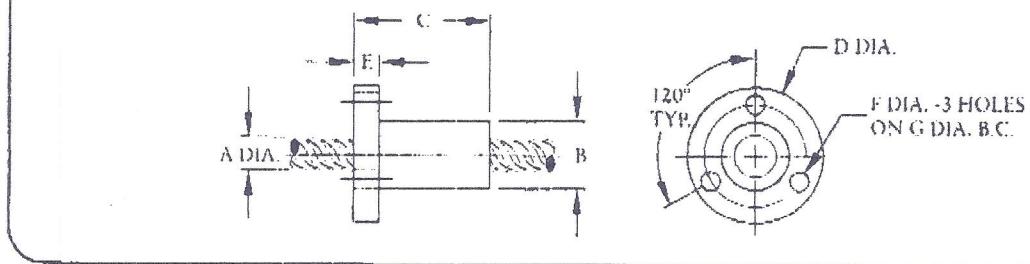
The secure mounting and convenience of a circular flange is standard on the "B" nuts with triangular flange and thread mounting as an option. Many custom configurations are available.

Screws are 303 stainless steel with Kerk's extended life custom TFE coating optional. Assemblies can be supplied cut-to-length or with ends machined to customer requirements.

Note: All B Series nuts are freewheeling.

BF SERIES - FLANGE MOUNT (ROUND)

Series	Screw Ø	Nut Ø	Nut Length	Flange Ø	Flange Thickness	Mounting Hole Ø	Bolt Circle Ø	Dynamic Load
	A in. (mm)	B in. (mm)		D in. (mm)	E in. (mm)	F in. (mm)	G in. (mm)	
BF4000	1/4 (6.35)	.50 (12.7)	1.0 (26)	1.00 (25.4)	.19 (4.8)	.140 (3.56)	.750 (19.05)	50 (20)
BF6000	3/8 (9.53)	.63 (15.9)	1.0 (26)	1.13 (28.6)	.19 (4.8)	.140 (3.56)	.875 (22.23)	75 (35)
BF7000	7/16 (11.11)	.75 (19.1)	1.5 (38)	1.50 (38.1)	.19 (4.8)	.203 (5.16)	1.125 (28.58)	90 (40)
BF8000	1/2 (12.7)	.75 (19.1)	1.5 (38)	1.50 (38.1)	.19 (4.8)	.203 (5.16)	1.125 (28.58)	130 (68)
BF10000	5/8 (15.88)	.88 (22.2)	1.5 (38)	1.50 (38.1)	.19 (4.8)	.203 (5.16)	1.188 (30.18)	225 (100)
BF12000	3/4 (19.05)	1.13 (28.6)	2.0 (51)	1.75 (44.5)	.25 (6.4)	.203 (5.16)	1.438 (36.53)	350 (160)
BF14000	7/8 (22.23)	1.50 (38.1)	2.0 (51)	2.25 (57.2)	.25 (6.4)	.203 (5.16)	1.875 (47.63)	500 (227)
BF15000	15/16 (23.81)	1.50 (38.1)	2.0 (51)	2.25 (57.2)	.25 (6.4)	.203 (5.16)	1.875 (47.63)	500 (227)



Flexible Technologies, Inc.

**7898 E. ACOMA DR., #108
SCOTTSDALE, AZ 85260**

**Phone: 480-443-4296
Fax: 480-443-4297**

FACSIMILE COVER SHEET

**TO: Bob Nagel
COMPANY: U of A
PHONE:
FAX: 520-621-3398**

**FROM: Chris Miller
PHONE: 480-443-4296
FAX: 480-443-4297**

**NO. OF PAGES: 3 including cover sheet
DATE: 11-2-01**

**COMMENTS: Bob,
The following are the mechanical specifications for the linear
motor stepper motor and standard stepper motor for your
application.
Please call if you have any questions.**

**Best regards,
Chris Miller**



1990 Russell Avenue
Santa Clara, CA 95054
(408) 919-0200
(408)-919-0201 Fax

Fax

To: Bob Nagel (U of A) From: Ryan Lin x 214

Fax: 520-621-3398 Pages: 3

Phone: Date: December 4, 2001

Re: Print confirmation CC:

Urgent For Review Please Comment Please Reply Please Recycle

Dear Bob,

Attached is a drawing for the motor you are purchasing from us through Flexible Technologies (Chris Miller).

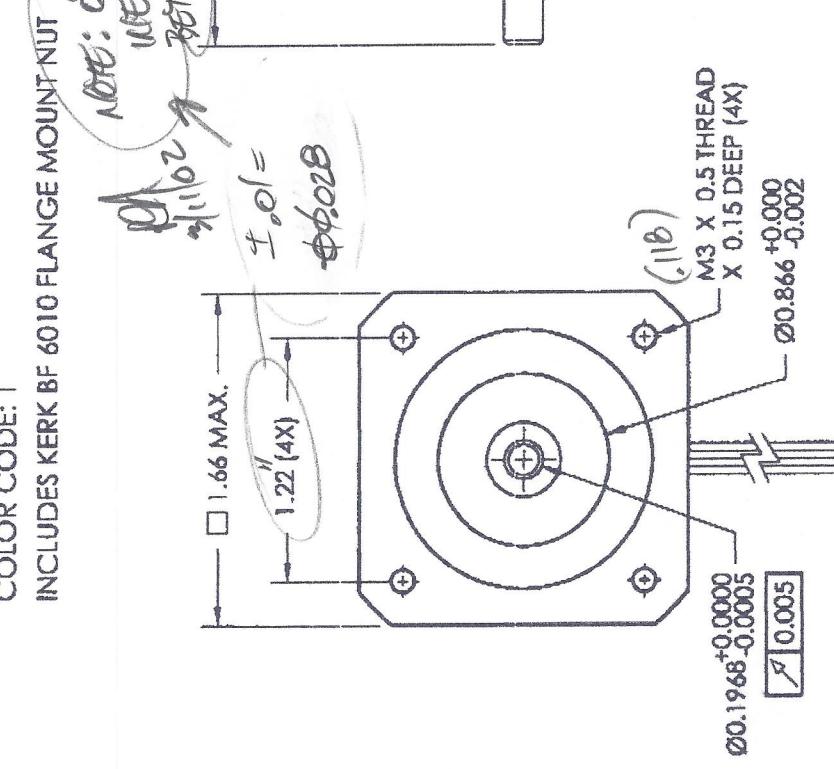
We need you to confirm this drawing by signing it and faxing it back. The kerk lead screw and BF nut is that of page 3 with the nut being free wheeling.

If you have any questions, please call me at 408-919-0200 x214 (dial zero to have the operator page me if I'm not at my desk.)

Regards,

Ryan Lin

DWG NO.	1-1771	REV A
NOTE:	RATED @ 1.3 AMP RESISTANCE PER PHASE: 2.2 OHM CONNECTION: 4 WIRES LEAD WIRE: 12-13 IN. LONG, #26 AWG COLOR CODE: 1	INCLUDES KERK BF 6010 FLANGE MOUNT
		NOTE: SPEC. DUG'S OF THEIR VERSITE MATERIALS (HOLE) BROKEN
		1.102 ± .002
		1.66 MAX.
		1.22 (4X)



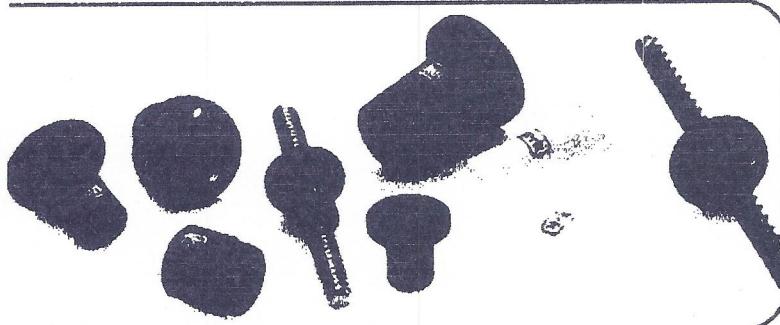
Unless Otherwise Specified
Dimensions Are In:
Inches (mm)
Tolerances Are:

ANGLES ± 1°	INCHES	MM	DATE	MATERIAL
.025 ± 0.01	.07 ± 0.025	2.25 ± 0.635	11/29/01	STEEL
.025 ± 0.005	.07 ± 0.013	2.25 ± 0.325		
.025 ± 0.005	.07 ± 0.013	2.25 ± 0.325		

APPROVALS	DRAWN	DATE	MATERIAL	LIN ENGINEERING
	Dp	11/29/01	STEEL	
		CHECKED	1.8° STEP MOTOR	
		ISSUED	SCALE 1:1 SHEET 1 OF 1	
				DO NOT SCALE DRAWING

B SERIES**B SERIES GENERAL PURPOSE LEAD SCREW ASSEMBLIES**

The Kerk B Series general purpose assembly is for applications not requiring anti-backlash and wear compensation. It provides effective power transmission at minimum cost, and features long life, self-lubricating polyacetal nuts.



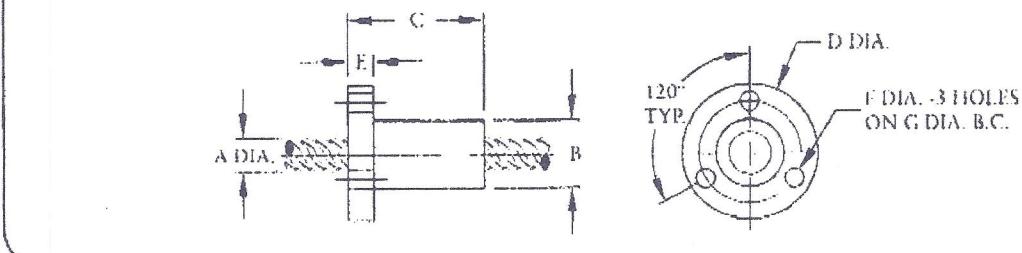
The secure mounting and convenience of a circular flange is standard on the "B" nuts with triangular flange and thread mounting as an option. Many custom configurations are available.

Screws are 303 stainless steel with Kerk's extended life custom TFE coating optional. Assemblies can be supplied cut-to-length or with ends machined to customer requirements.

Note: All B Series nuts are freewheeling.

BF SERIES - FLANGE MOUNT (ROUND)

Series	Screw Ø	Nut Ø	Nut Length	Flange Ø	Flange Thickness	Mounting Hole Ø	Bolt Circle Ø	Dynamic Load
	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)	G in. (mm)	lbs. (kg)
BF4000	1/4 (6.35)	.50 (12.7)	1.0 (26)	1.00 (25.4)	.19 (4.8)	.140 (3.56)	.750 (19.05)	50 (20)
BF6000	3/8 (9.53)	.63 (15.9)	1.0 (26)	1.13 (28.6)	.19 (4.8)	.140 (3.56)	.875 (22.23)	75 (35)
BF7000	7/16 (11.11)	.75 (19.1)	1.5 (38)	1.50 (38.1)	.19 (4.8)	.203 (5.16)	1.125 (28.58)	90 (40)
BF8000	1/2 (12.7)	.75 (19.1)	1.5 (38)	1.50 (38.1)	.19 (4.8)	.203 (5.16)	1.125 (28.58)	150 (68)
BF10000	5/8 (15.88)	.88 (22.2)	1.5 (38)	1.50 (38.1)	.19 (4.8)	.203 (5.16)	1.188 (30.18)	225 (100)
BF12000	3/4 (19.05)	1.13 (28.6)	2.0 (51)	1.75 (44.5)	.25 (6.4)	.203 (5.16)	1.438 (36.53)	350 (160)
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BF15000	15/16 (23.81)	1.50 (38.1)	2.0 (51)	2.25 (57.2)	.25 (6.4)	.203 (5.16)	1.875 (47.63)	500 (227)

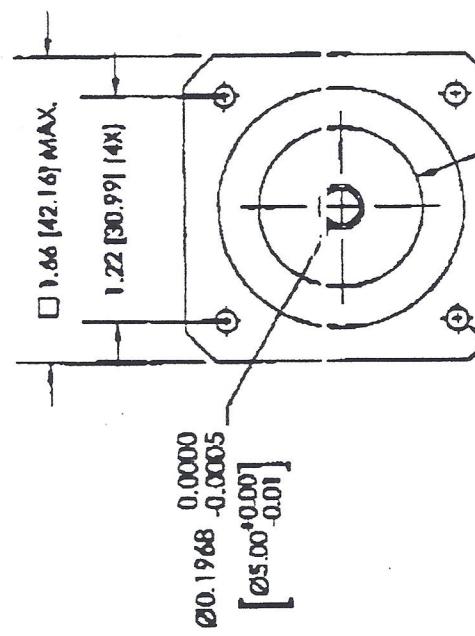
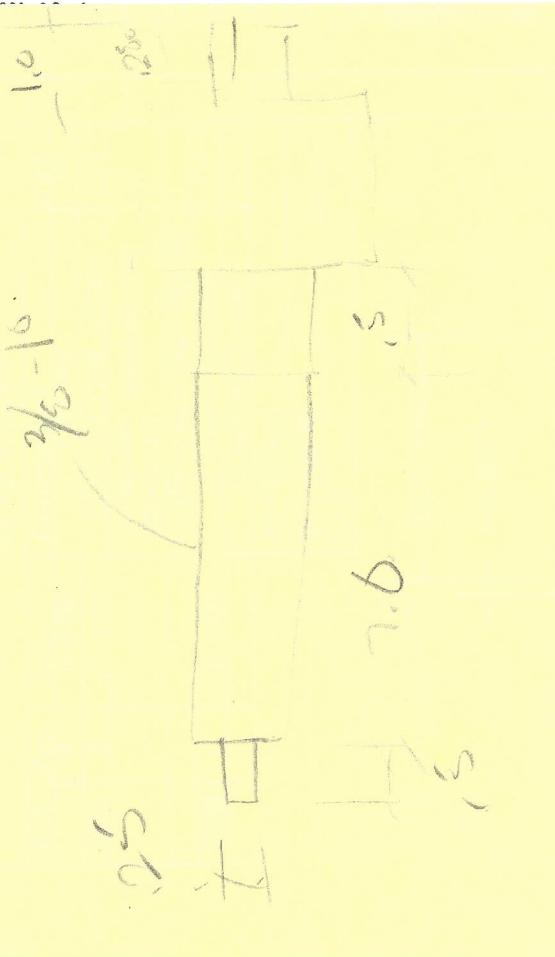


MOTOR NO. 1-136 REV C

MOTOR NO.

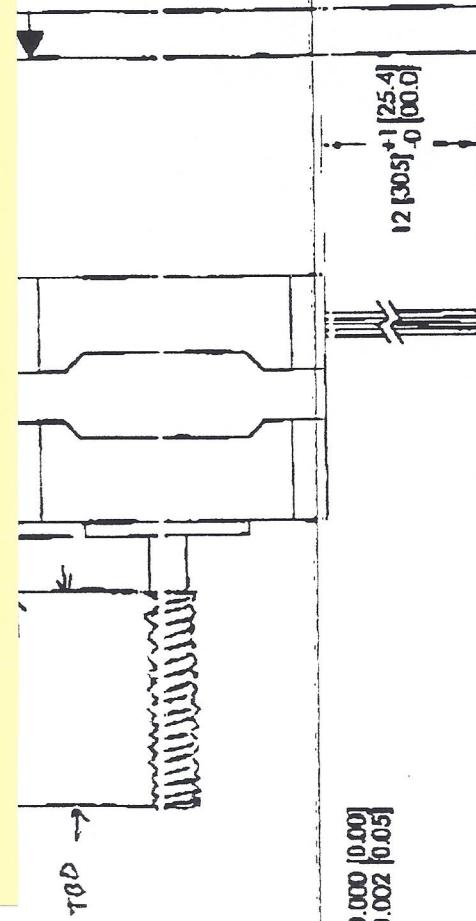
4218S-02

NOTE: RATED @ 1.3 AMP
RESISTANCE PER PHASE: 2.2 OHM
CONNECTION: 4 WIRES
LEAD WIRE: 12-13 IN. LONG, #26 AWG
COLOR CODE #1



FAX NO. 14089190201

P. 03/03



Ø 0.866 [22.00] 0.000 [0.05]

M3 x 0.5 THREAD
X 0.15 [3.81] DEEP (4X)

Actual dimensions are as specified
Refer to drawing no.:

APPROVALS	DATE	MATERIAL
DRAWN VK	4/8/96	SUPER HIGH TORQUE MOTOR
CHECKED	1/2/97	SCALE 1:1
ISSUED	1/31/97	1 OF 1
		DO NOT SCALE DRAWING

APPROVALS

DATE

MATERIAL

DRAWN VK

4/8/96

SUPER HIGH TORQUE MOTOR

CHECKED

1/2/97

SCALE 1:1

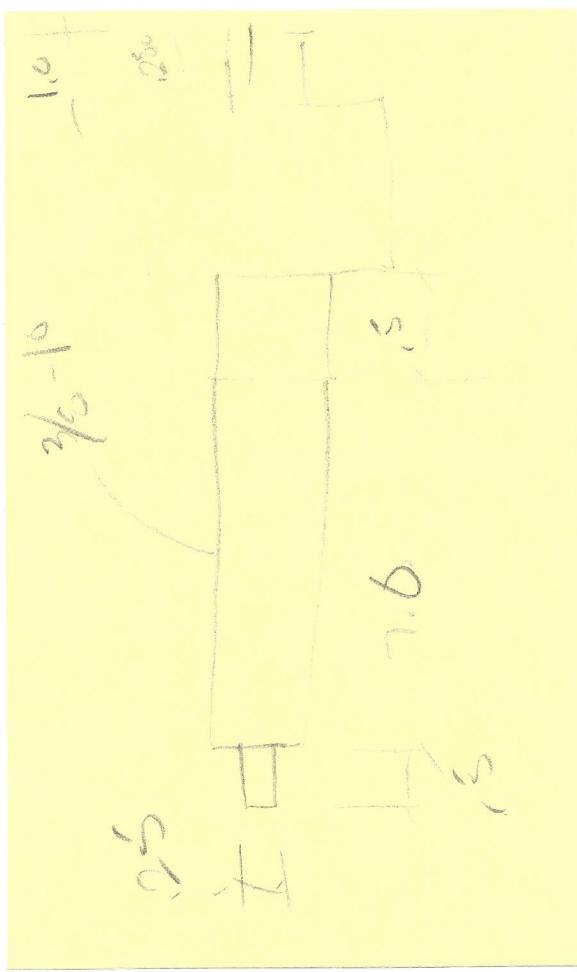
ISSUED

1/31/97

1 OF 1

LIN ENGINEERING

DO NOT SCALE DRAWING



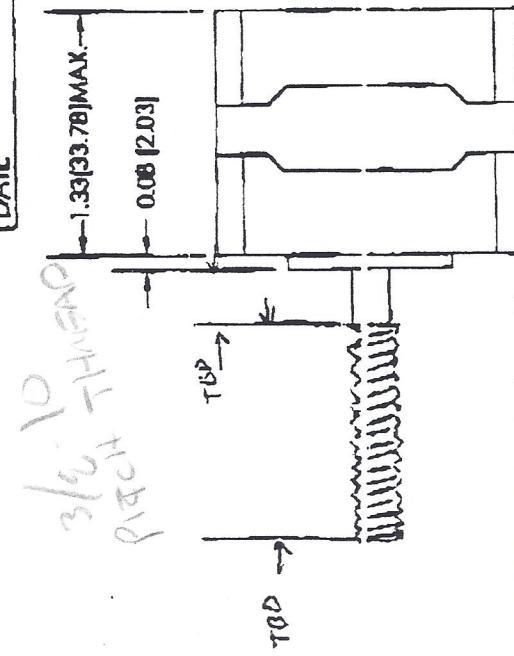
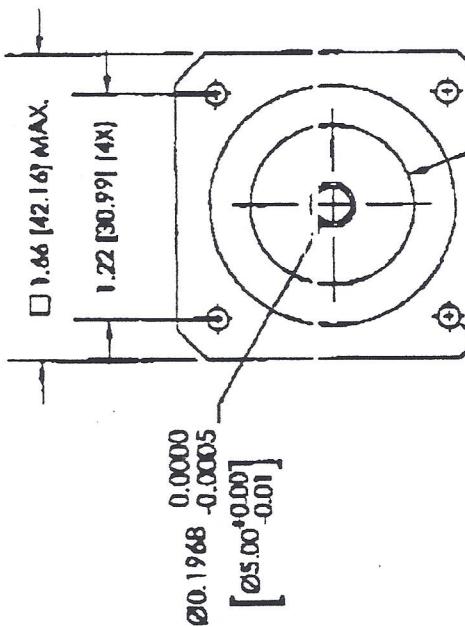
42185-02

REV C
1-136

REVISIONS

SCN	Rev.	Date	Description	Unit
0535	A	4-8-96	ORIGINAL	VK
	B	7/14/92	COLOR CODE ADDED 0.94±0.020 WAS 0.94(23.90) [23.90±0.51]	TN
0958	C	8/7/00	1.33[3.78] MAX WAS 1.22[30.91] 2.2 OHM WAS 2.0 OHM 1.3 AMP WAS 2.2 AMP	DP

NOTE: RATED @ 1.3 AMP
RESISTANCE PER PHASE: 2.2 OHM
CONNECTION: 4 WIRES
LEAD WIRE: 12-13 IN. LONG, #126 AWG
CDI QR CODE #1



- 90.866 122.001

12 [305] + 1 [25.4]
- 12 [305] - 0 [00.0]

12 [305] + 1 [25.4]
- 12 [305] - 0 [00.0]

Journal of Statistical

APPROVALS		DATE	MATERIAL	
DRAWN	VK	4/8/96	SUPER HIGH TORQUE MOTOR	
REVIEWED	RECORDED	CHIEF ENGINEER	SCALE	1 OF 1
REVIEWED	RECORDED	DESIGNER	1 : 1	SHEET
REVIEWED	RECORDED	31/5		

TIN ENGINEERING

DRAWING TO SCALE

DRAWING NO.	4218S-02 D-13		
REVISIONS			
ECN	Rev.	Date	Description
	A	4-8-96	ORIGINAL
0535	B	7/14/99	COLOR CODE ADDED 0.94 OHM WAS 0.94[23.90] [23.90±0.5]
025B	C	8/7/00	1.33[33.78] MAX WAS 1.22[30.99] 2.2 OHM WAS 2.0 OHM 1.3 AMP WAS 2.2 AMP
APPROVAL		VK	
SIGNATURE		IN	
DATE		DP	

NOTE: RATED @ 1.3 AMP
RESISTANCE PER PHASE: 2.2 OHM
CONNECTION: 4 WIRES
LEAD WIRE: 12-13 IN. LONG, #26 AWG
COLOR CODE #1

Other Information Specified
Shafting from:
Motors from:
Polarities are:
Angle ± 1°

APPROVALS	DATE	MATERIAL
DRAWN	VK	4/8/96
CHECKED		1/1
ISSUED		1 OF 1

LIN ENGINEERING

DO NOT SCALE DRAWING



1990 Russell Avenue
Santa Clara, CA 95054
(408) 919-0200
(408)-919-0201 Fax

COPY

To: Warren
Davison

Fax

To: Bob Nagel (U of A) From: Ryan Lin x 114
Fax: 520-621-3398 Pages: 3
Phone: Date: November 1 2001
Re: Torque Speed Curves CC:

Urgent For Review Please Comment Please Reply Please Recycle

Bob,

Attached are the torque speed curves you requested through our distributor Flexible Technologies (Chris Miller)

5718M-05S

100 oz-in at 1 RPS (200pps full stepping)

4218S-02

With a 3/8 x 10 leadscrew, this a motor would require 13 oz inches at 1000pps full stepping to move a 10 Lb load across 5" in 10 seconds.

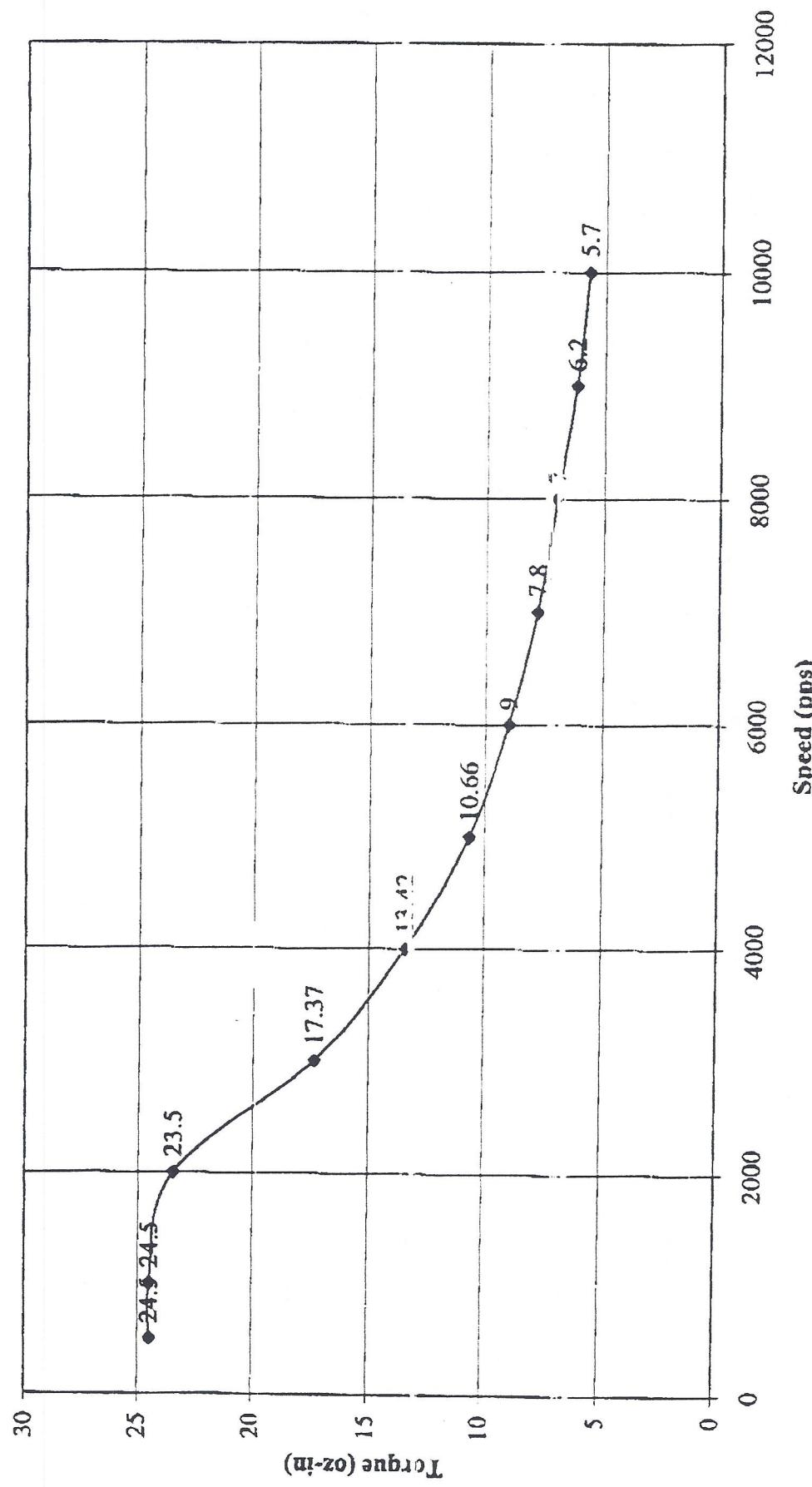
You may contact me if you have more questions about the motors I've specified for your application.

Regards,

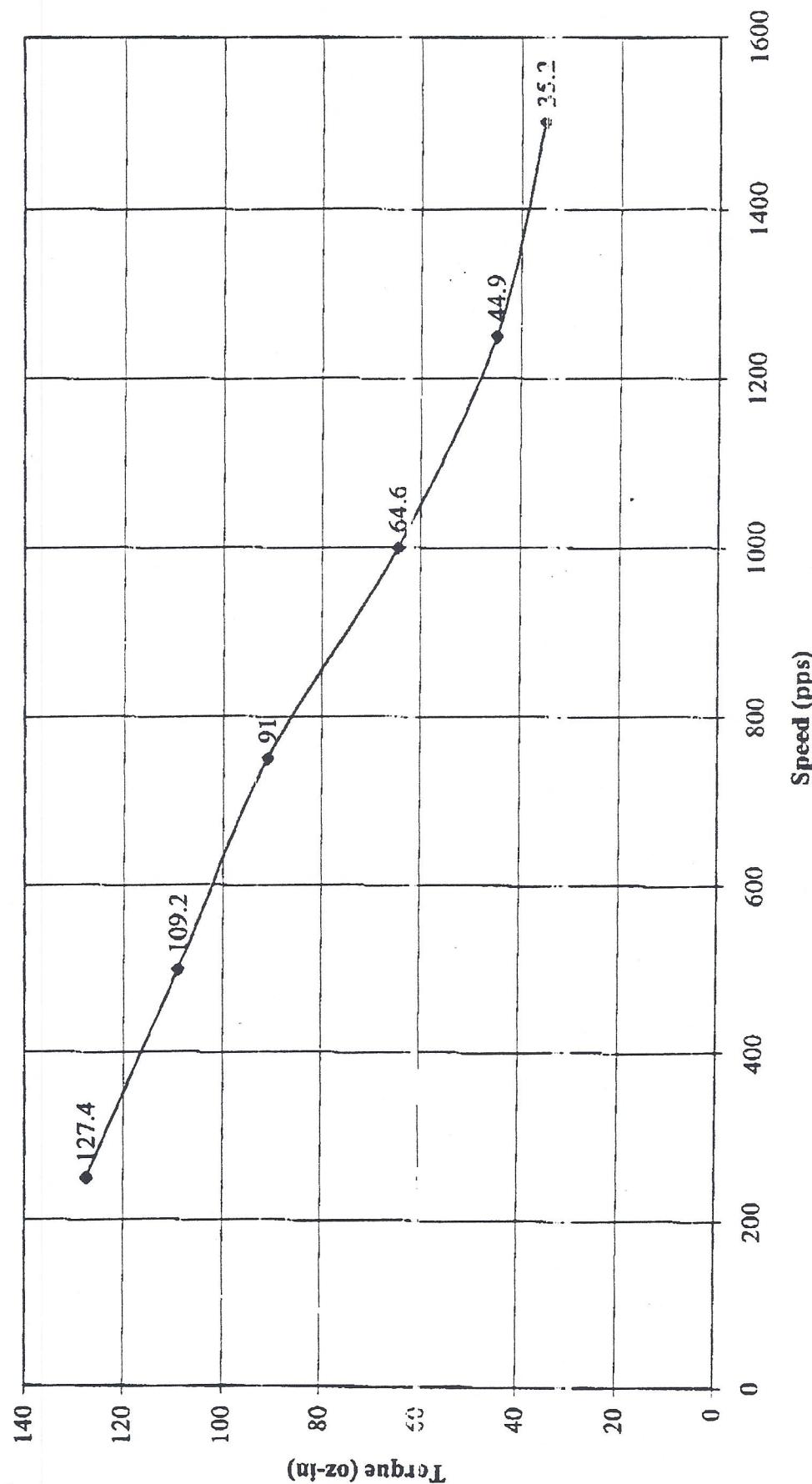
Ryan

CC: Flexible / Chris Miller

Lin Engineering 4218S-02
28vDC, 1.3Amp/Phase, Bipolar Chopper, Full Stepping

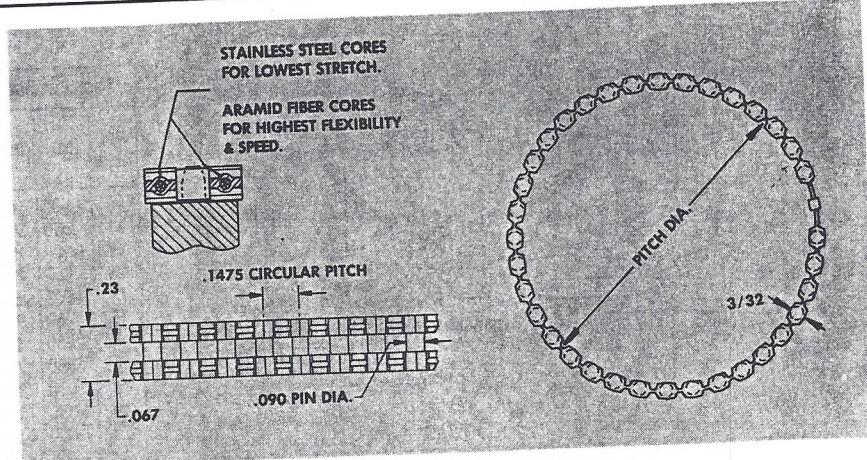


Lin Engineering 5718M-05S
24vDC, 1.4Amp/Phase, Bipolar, Full Stepping



NO-SLIP POSITIVE DRIVE BELT

.1475CP, Twin Core Economical High Performance Miniature Steel Chain Replacement



Material:

FRA - Series: Molded Polyurethane, Aramid Fiber Cores. Color: Clear, Green Cores.
FRS - Series: Molded Polyurethane, Stainless Steel Cores. Color: Clear, Red Cores.

Number of Drive Pins	Circumference at Pitch Dia. (Ref.)	Part No. Aramid Core	Part No. Steel Core
40	5.900	FRA-040	FRS-040
50	7.375	FRA-050	FRS-050
60	8.850	FRA-060	FRS-060
70	10.325	FRA-070	FRS-070
80	11.800	FRA-080	FRS-080
90	13.275	FRA-090	FRS-090
100	14.750	FRA-100	FRS-100
110	16.225	FRA-110	FRS-110
120	17.700	FRA-120	FRS-120
130	19.175	FRA-130	FRS-130
140	20.650	FRA-140	FRS-140
150	22.125	FRA-150	FRS-150
160	23.600	FRA-160	FRS-160
170	25.075	FRA-170	FRS-170
180	26.550	FRA-180	FRS-180
190	28.025	FRA-190	FRS-190
200	29.500	FRA-200	FRS-200
210	30.975	FRA-210	FRS-210

Number of Drive Pins	Circumference at Pitch Dia. (Ref.)	Part No. Aramid Core	Part No. Steel Core
220	32.450	FRA-220	FRS-220
230	33.925	FRA-230	FRS-230
240	35.400	FRA-240	FRS-240
250	36.825	FRA-250	FRS-250
260	38.350	FRA-260	FRS-260
270	39.825	FRA-270	FRS-270
280	41.300	FRA-280	FRS-280
290	42.775	FRA-290	FRS-290
300	44.250	FRA-300	FRS-300
310	45.725	FRA-310	FRS-310
320	47.200	FRA-320	FRS-320
330	48.675	FRA-330	FRS-330
340	50.150	FRA-340	FRS-340
350	51.625	FRA-350	FRS-350
360	53.100	FRA-360	FRS-360
370	54.575	FRA-370	FRS-370
380	56.050	FRA-380	FRS-380
390	57.525	FRA-390	FRS-390

Special Length Belts & Bulk Lengths Available, Consult Factory.

.1475 CP TWIN CORE NO-SLIP BELTS. CAT. SERIES FRA & FRS

The workhorse of the No-Slip line. Designed to provide an economical alternative to miniature pitch stainless steel chain. Smoother motion than possible with chain. FRA & FRS belts operate without the chordal rise and fall (camming effect) of chain. Will not continually grow in length as chain does. Drive pins are 30% larger in diameter than the FM series for additional strength. Recommended as a cost saving alternative to chain and for the highest load belt applications requiring No-Slip accuracy. Will replace miniature pitch steel chain in many existing applications.

SPlicing
KIT

Bulk Lengths — Not Spliced

Length	Aramid Core Part Number	Steel Core Part Number
5 Ft	FRA-5FT	FRS-5FT
10 Ft	FRA-10FT	FRS-10FT
25 Ft	FRA-25FT	FRS-25FT
50 Ft	FRA-50FT	FRS-50FT
100 Ft	FRA-100FT	FRS-100FT

Consult factory for the availability of a field splicing kit.

27.0436 φ
P.D. ON
FILTER DISK

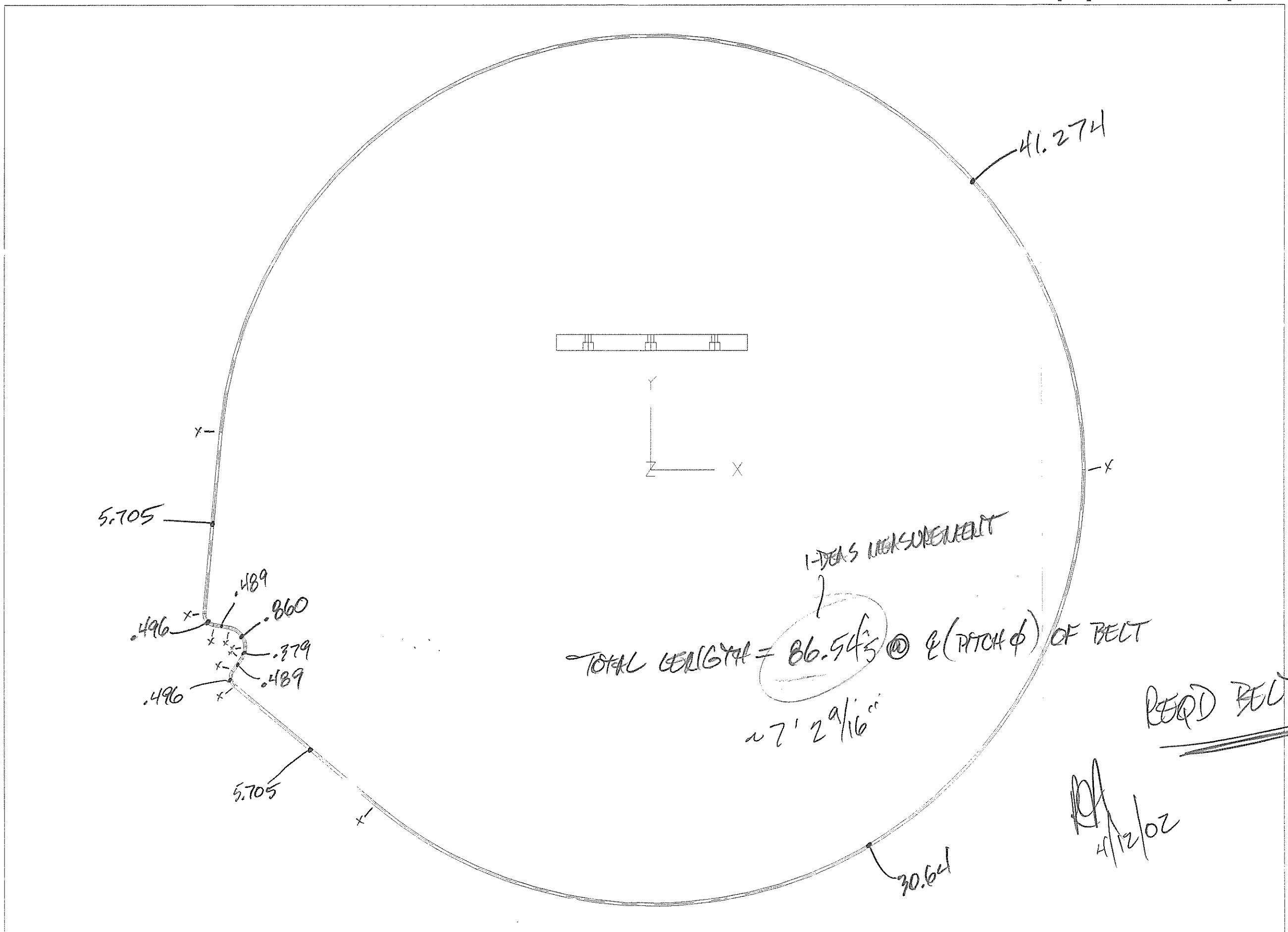
& USE A

24 TOOTH F

12 TOOTH
SPROCKET FOR

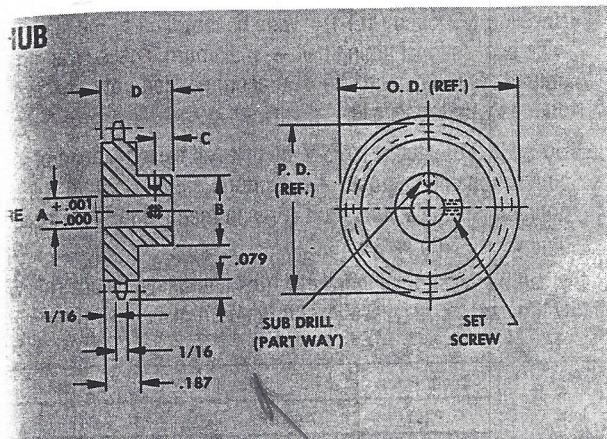
MOTION &
10FALFA

90 PRIME TOP BOX
FILTER WHEEL
ROTATION DRIVE
DRIVE BELT & SPROCKETS



NO-SLIP SPROCKETS

.1475CP, 1/8, 3/16, 1/4, Bores For FRA & FRS No-Slip, Twin Core Drive Belts



Material: 303 Stainless Steel
2024-T4 Aluminum
(Anodized Before Cutting)

Bore Size				
1/8"	3/16"	1/4"	4 mm	6 mm
.1248	.1873	.2498	.1573	.2360
.312	.375	.500	.375	.500
.090	.110	.120	.110	.120
.375	.406	.437	.406	.437
#2	#4=40	#6-32	M2X.4	M3X.5

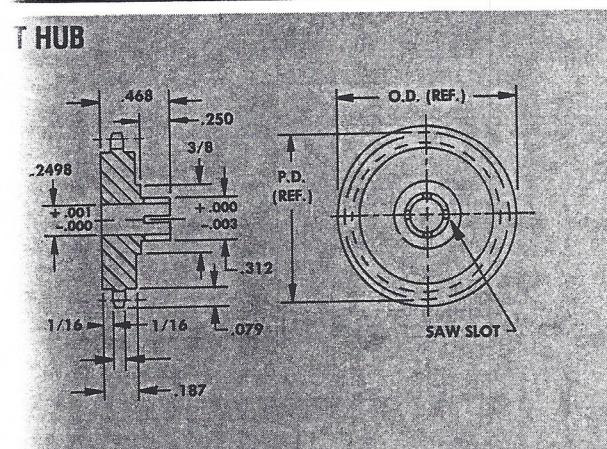
DIM
A
B
C
D

No. Teeth	P.D.	O.D.	Sprocket Data			Stainless Steel			Aluminum		
			Part No.			Bore Size		Part No.			
			.1248	.1873	.2498	.1248	.1873	.2498	.1248	.1873	.2498
10	.477	.529	FRG1-010	FRG3-010	-	FRG2-010	FRG4-010	-			
11	.524	.576	FRG1-011	FRG3-011	-	FRG2-011	FRG4-011	-			
12	.570	.622	FRG1-012	FRG3-012	-	FRG2-012	FRG4-012	-			
13	.616	.668	FRG1-013	FRG3-013	FRG5-013	FRG2-013	FRG4-013	FRG6-013			
14	.663	.715	FRG1-014	FRG3-014	FRG5-014	FRG2-014	FRG4-014	FRG6-014			
15	.709	.761	FRG1-015	FRG3-015	FRG5-015	FRG2-015	FRG4-015	FRG6-015			
16	.756	.808	FRG1-016	FRG3-016	FRG5-016	FRG2-016	FRG4-016	FRG6-016			
17	.803	.855	FRG1-017	FRG3-017	FRG5-017	FRG2-017	FRG4-017	FRG6-017			
18	.849	.901	FRG1-018	FRG3-018	FRG5-018	FRG2-018	FRG4-018	FRG6-018			
19	.896	.948	FRG1-019	FRG3-019	FRG5-019	FRG2-019	FRG4-019	FRG6-019			
20	.943	.995	FRG1-020	FRG3-020	FRG5-020	FRG2-020	FRG4-020	FRG6-020			
22	1.036	1.088	FRG1-022	FRG3-022	FRG5-022	FRG2-022	FRG4-022	FRG6-022			
24	1.130	1.182	FRG1-024	FRG3-024	FRG5-024	FRG2-024	FRG4-024	FRG6-024			
25	1.177	1.228	FRG1-025	FRG3-025	FRG5-025	FRG2-025	FRG4-025	FRG6-025			
26	1.224	1.276	FRG1-026	FRG3-026	FRG5-026	FRG2-026	FRG4-026	FRG6-026			
28	1.317	1.369	FRG1-028	FRG3-028	FRG5-028	FRG2-028	FRG4-028	FRG6-028			
30	1.411	1.463	FRG1-030	FRG3-030	FRG5-030	FRG2-030	FRG4-030	FRG6-030			
32	1.505	1.557	FRG1-032	FRG3-032	FRG5-032	FRG2-032	FRG4-032	FRG6-032			
35	1.645	1.697	FRG1-035	FRG3-035	FRG5-035	FRG2-035	FRG4-035	FRG6-035			
36	1.692	1.744	FRG1-036	FRG3-036	FRG5-036	FRG2-036	FRG4-036	FRG6-036			
40	1.880	1.932	FRG1-040	FRG3-040	FRG5-040	FRG2-040	FRG4-040	FRG6-040			
45	2.114	2.166	FRG1-045	FRG3-045	FRG5-045	FRG2-045	FRG4-045	FRG6-045			
48	2.255	2.307	FRG1-048	FRG3-048	FRG5-048	FRG2-048	FRG4-048	FRG6-048			
50	2.349	2.401	-	FRG3-050	FRG5-050	-	FRG4-050	FRG6-050			
55	2.584	2.636	-	FRG3-055	FRG5-055	-	FRG4-055	FRG6-055			
60	2.818	2.870	-	FRG3-060	FRG5-060	-	FRG4-060	FRG6-060			
65	3.053	3.105	-	FRG3-065	FRG5-065	-	FRG4-065	FRG6-065			
85	3.992	4.044	-	FRG3-085	FRG5-085	-	FRG4-085	FRG6-085			

For Metric Bores:

Bore	Stainless Steel	Aluminum
4 mm	MFRG1-XX	MFRG2-XX
6 mm	MFRG3-XX	MFRG4-XX

XX = Number of grooves



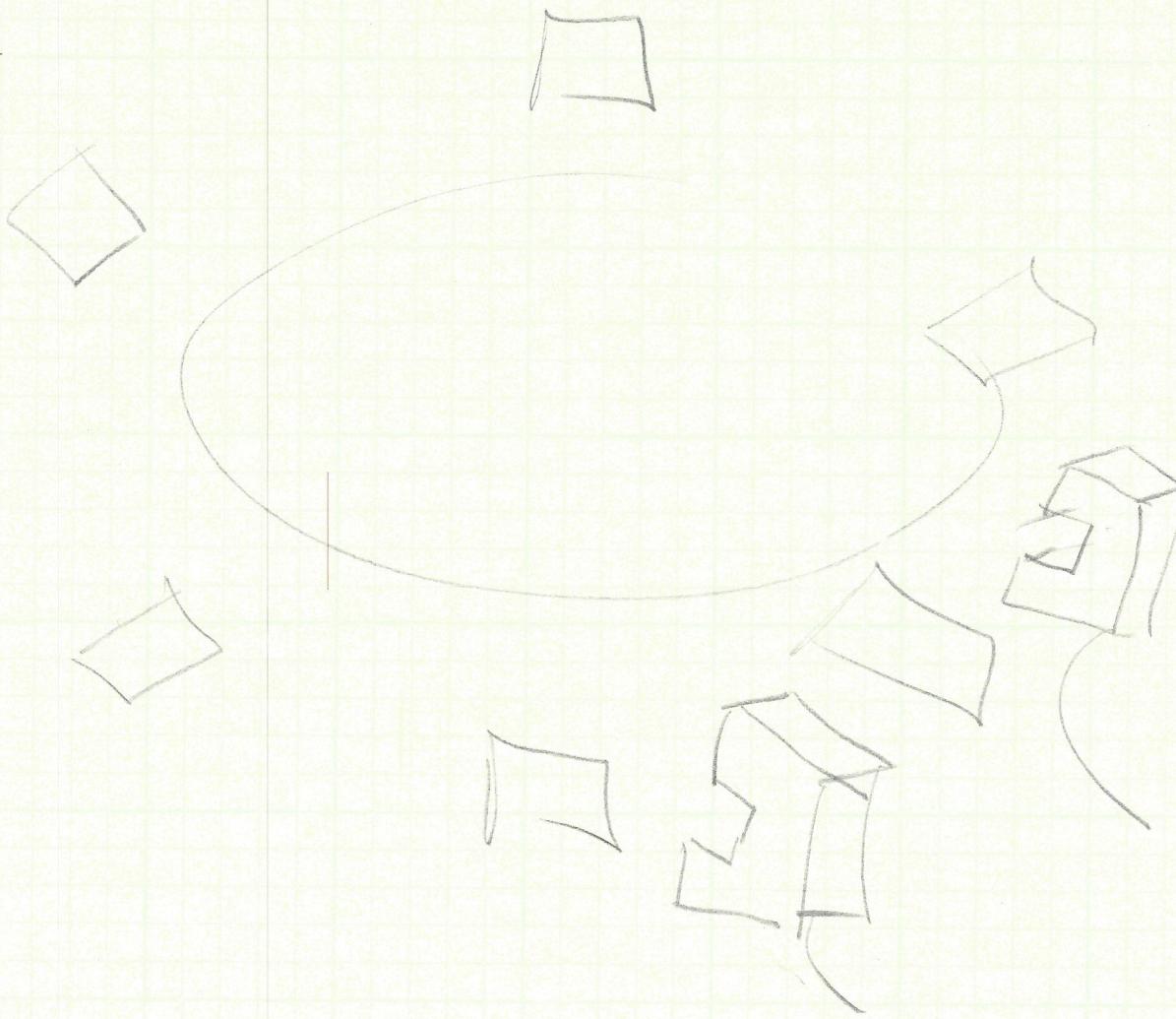
Bores Available, Consult Factory.
Specify the Number of Teeth, Specify the Number of Teeth desired as the last figure in the part number.
E: For a 52 Tooth Sprocket, Specify Part Number: FMH5-052.
Same method to designate larger sprockets than shown in above table.

No. Teeth	P.D.	O.D.	Sprocket Data		Stainless Steel	Aluminum
			Part No.	Part No.		
13	.661	.668	FRH5-013	FRH6-013		
14	.663	.715	FRH5-014	FRH6-014		
15	.709	.761	FRH5-015	FRH6-015		
16	.756	.808	FRH5-016	FRH6-016		
17	.803	.855	FRH5-017	FRH6-017		
18	.849	.901	FRH5-018	FRH6-018		
19	.896	.948	FRH5-019	FRH6-019		
20	.943	.995	FRH5-020	FRH6-020		
22	1.036	1.088	FRH5-022	FRH6-022		
24	1.130	1.182	FRH5-024	FRH6-024		
25	1.177	1.228	FRH5-025	FRH6-025		
26	1.224	1.276	FRH5-026	FRH6-026		
28	1.317	1.369	FRH5-028	FRH6-028		
30	1.411	1.463	FRH5-030	FRH6-030		
32	1.505	1.557	FRH5-032	FRH6-032		
35	1.645	1.697	FRH5-035	FRH6-035		
36	1.692	1.744	FRH5-036	FRH6-036		
40	1.880	1.932	FRH5-040	FRH6-040		
45	2.114	2.166	FRH5-045	FRH6-045		
48	2.255	2.307	FRH5-048	FRH6-048		

NOTES FOR HALL EFFECT

12 PLATES REQ'D
ON SAME PLANE
MAYBE DIFFERENT LENGTH
PLATES.

THE SHORTEST LENGTH
 $\frac{1}{2}$ & $1\frac{1}{16}$ " INCHES



13-782 500 SHEETS FILLER 5 SQUARE
42-383 50 SHEETS EYE-EASE® 5 SQUARE
42-382 100 SHEETS EYE-EASE® 5 SQUARE
42-389 200 SHEETS EYE-EASE® 5 SQUARE
42-392 100 RECYCLED WHITE 5 SQUARE
42-393 200 RECYCLED WHITE 5 SQUARE

National® Brand
Made in U.S.A.



MOTION INDUSTRIES
BUS: 520/882-6800
FAX: 520/882-6804

FROM: RAY DARLING

MAIN BEARING
TOP Box 111
Prima Focus 90"

Attention: DAVE / U of A.
Date: 4-19-99
Fax number: 626 - 4330
Number of pages: 2

OBsolete

1pc - KD 160 X PO Brg. \$ 2,626.83 EA

STK - Kaydon / Sumter S.C.

Fab - shipping point

DAVE,

RBC had no stock and no production date.
The bearing I'm quoting is Kaydon
(Spec sheet included)

Reference Quote# 27730

THANK YOU

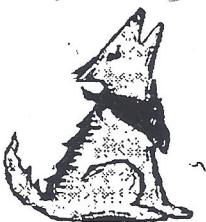
GRANT & DAVID -

Ray

Beware - This quote was for the
Φ16" bore bearing. Ray should be able to refresh
quote for Φ18" ID

Motion Industries
1802 E. Grant
Ste. 107
Tucson, AZ 85746

Bus: 520/882-6800



David Ouellette

From: David H Dean [ddean@as.arizona.edu]
Sent: Wednesday, February 28, 2001 9:46 AM
To: David Ouellette
Cc: Warren Davison
Subject: Fw: Need Info on

----- Original Message -----

From: Lisman, Sharon <slisman@kaydon.com>
To: David H Dean <ddean@as.arizona.edu>
Sent: Wednesday, February 28, 2001 11:20 AM
Subject: RE: Need Info on

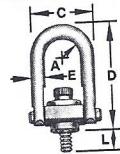
> Please send us your specific part number as you have given us a model number. If you don't have a part number, please call Rob Roos at 231/755-3741 at Ext. 353 for information.

>
> Thank you.
> Kaydon Engineering
>
> -----Original Message-----
> From: David H Dean [SMTP:ddean@as.arizona.edu]
> Sent: Wednesday, February 28, 2001 11:05 AM
> To: engineering@kaydon.com
> Subject: Need Info on
>
> Hi All,
>
> I need specifications on a Kaydon #KD18XPO bearing.
> Such as H,W,L,OD,ID and so on, basically I need all dimensions so I can make
> a (3D) model of this part assembly.
> I am using I-DEAS ver 7 program for this project.
>
> David Dean ddean@as.arizona.edu
> Design Coordinator
> Room 357
> Steward Observatory
> 933 N. Cherry Ave.
> Tucson, AZ 85721
>
>

Line No.	Item Drawing	Reference	Manufacturer	P/N	Quantity	Cost
1	10828	handle (7)	Accurate Screw Machine Co	8406-4.000-440-S-FG-R	8	
2	filterfc1	DualVee wheels	Bishop-Wisecarver	W1SSX	48	
3	filterfc1	DualVee bushing-stationary	Bishop-Wisecarver	B1SS	24	
4	filterfc1	DualVee bushing-adjustable	Bishop-Wisecarver	BX1SS	24	
5	10832	Dual-Vee track	Bishop-Wisecarver	T1-SS-30"	5	
6						
7	Disk Bearing	Kaydon				
8	Filter Clamp	Clippard				
9	Pneumatic Cylinder	Minimatic				
10		Ion Systems				
11						
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33						

Hoist RING TOP Box *PRIMER Focus 90°*

Hoist Rings



Rings pivot 180° and swivel 360° to compensate for pitch, roll, and sway when lifting unbalanced loads. We offer hoist rings in industry-standard alloy steel, economical one-piece forged steel, and metric drawn steel. Load ratings are for lifts in any direction.

Safety Note: Some loosening may develop after prolonged service in a permanent installation. Retighten mounting screws periodically to maintain the specified torque.

Replacement bolts come complete with clip.

ALLOY STEEL—Also Available: Longer inside radius rings and ti-cad plated rings. Please ask for 3052T999 and specify requirements.

DROP-FORGED STEEL—These rings meet MIL-STD 1365 (11) or MIL-STD 209C.

METRIC—Meet MIL-STD 1365A.

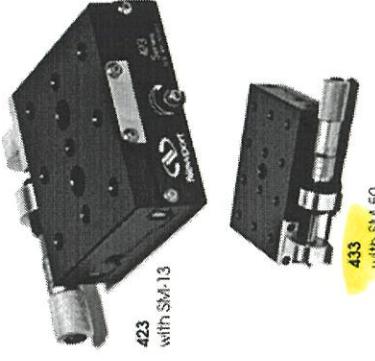
TYPE 300 SERIES STAINLESS STEEL—Where indicated with a ♦, Type 300 series stainless steel rings are available. Please ask for 2949T886 and specify dimensions as shown in the table. Note: Work load limit is about 50% less than alloy steel rings.

Bolt Size	Thread Torque, Ft.-Lbs.	Dimensions					Work Load Limit, Lbs.	Hoist Ring	Replacement Bolt	Each	
		A	C	D	E	L					
Alloy Steel Hoist Rings											
5/16"-18	7	0.43"	1.61"	2.67"	0.375"	0.29"	800	3052T102	\$60.31	3052T21	\$5.81
5/16"-18	7	0.43"	1.61"	2.67"	0.375"	0.54"	800	3052T55♦	60.31	3052T21	5.81
5/8"-16	12	0.43"	1.61"	2.67"	0.375"	0.54"	1,000	3052T56♦	60.31	3052T22	5.81
1/2"-13	28	0.70"	2.40"	3.77"	0.50"	1.07"	2,500	3052T57	73.33	3052T23	7.71
1/2"-13	28	0.68"	3.25"	4.78"	0.75"	1.03"	2,500	3052T72	74.47	3052T23	7.71
1/2"-13	28	0.68"	3.25"	6.72"	0.75"	1.03"	2,500	3052T87	80.14	3052T23	7.71
1/2"-13	28	0.68"	3.25"	4.78"	0.75"	0.78"	2,500	3052T58	74.47	3052T24	7.71
1/2"-13	28	0.68"	3.25"	6.72"	0.75"	0.78"	2,500	3052T86	80.14	3052T24	7.71
1/2"-13	28	0.68"	3.25"	4.78"	0.75"	1.28"	2,500	3052T81♦	77.52	3052T26	7.71
1/2"-13	28	0.68"	3.25"	6.72"	0.75"	1.28"	2,500	3052T88	80.14	3052T26	7.71
5/8"-11	60	0.88"	3.25"	4.78"	0.75"	0.78"	4,000	3052T73	72.58	3052T27	8.93
5/8"-11	60	0.88"	3.25"	6.72"	0.75"	1.03"	4,000	3052T59	74.22	3052T28	8.93
5/8"-11	60	0.88"	3.25"	4.78"	0.75"	1.03"	4,000	3052T89	80.14	3052T28	8.93
5/8"-11	60	0.88"	3.25"	6.72"	0.75"	1.28"	4,000	3052T61♦	74.22	3052T29	8.93
5/8"-11	60	0.88"	3.25"	4.78"	0.75"	1.28"	4,000	3052T91	80.14	3052T29	8.93
3/4"-10	100	0.88"	3.25"	4.78"	0.75"	1.03"	5,000	3052T62	74.22	3052T31	11.97
3/4"-10	100	0.88"	3.25"	6.72"	0.75"	1.03"	5,000	3052T92	80.14	3052T32	13.05
3/4"-10	100	0.88"	3.25"	4.78"	0.75"	1.53"	5,000	3052T63♦	74.22	3052T32	13.05
3/4"-10	100	0.88"	3.25"	6.72"	0.75"	1.53"	5,000	3052T93	80.14	3052T33	13.12
3/4"-10	100	1.40"	4.80"	6.52"	1"	1.04"	7,000	3052T64	154.33	3052T33	13.12
3/4"-10	100	1.40"	4.80"	8.11"	1"	1.04"	7,000	3052T94	170.53	3052T33	13.12
3/4"-10	100	1.40"	4.80"	6.52"	1"	1.54"	7,000	3052T82♦	164.22	3052T34	14.06
3/4"-10	100	1.40"	4.80"	8.11"	1"	1.54"	7,000	3052T95	170.53	3052T34	14.06
7/8"-9	160	1.40"	4.80"	6.52"	1"	1.04"	8,000	3052T65♦	167.67	3052T35	18.05
7/8"-9	160	1.40"	4.80"	8.11"	1"	1.04"	8,000	3052T96	177.63	3052T35	18.05
1"-8	230	1.40"	4.93"	6.52"	1"	1.29"	10,000	3052T66	166.23	3052T36	20.42
1"-8	230	1.40"	4.93"	8.11"	1"	1.29"	10,000	3052T97	177.63	3052T36	20.42
1"-8	230	1.40"	4.93"	6.52"	1"	1.54"	10,000	3052T67	169.69	3052T37	20.97
1"-8	230	1.40"	4.93"	8.11"	1"	1.54"	10,000	3052T98	177.63	3052T37	20.97
1"-8	230	1.40"	4.93"	6.52"	1"	2.29"	10,000	3052T83♦	177.14	3052T38	28.27
1"-8	230	1.40"	4.93"	8.11"	1"	2.29"	10,000	3052T101	177.63	3052T38	28.27
1/4"-7	470	1.75"	6"	8.73"	1.25"	1.89"	15,000	3052T68	274.95	3052T39	56.26
1/4"-6	800	2.25"	8"	12.47"	1.75"	2.70"	24,000	3052T74	342.39	3052T41	97.64
2"-4 1/2	800	2.25"	8"	12.47"	1.75"	2.96"	30,000	3052T69	427.08	●	●
2 1/2"-8	2100	3"	10.50"	16.87"	2.25"	4"	50,000	3052T77	1292.04	●	●
2 1/2"-4	2100	3"	10.50"	16.87"	2.25"	4"	50,000	3052T75	1292.04	●	●
3"-4	4300	3.75"	13"	19.50"	2.75"	5.20"	75,000	3052T76	2158.22	●	●
Drop-Forged Steel Hoist Rings											
5/16"-18	7	0.65"	2.29"	3.23"	0.44"	0.56"	800	2994T61	52.50	2994T15	6.07
5/16"-18	7	0.65"	2.29"	3.23"	0.44"	1.06"	800	2994T62	52.50	2994T16	6.07
3/8"-16	12	0.65"	2.29"	3.23"	0.44"	0.56"	1,000	2994T63	52.50	2994T17	6.07
3/8"-16	12	0.65"	2.29"	3.23"	0.44"	1.06"	1,000	2994T64	52.50	2994T18	6.07
1/2"-13	28	0.88"	3.13"	4.71"	0.75"	1"	2,500	2994T65	61.24	2994T19	8.59
1/2"-13	28	0.88"	3.13"	4.71"	0.75"	1.25"	2,500	2994T66	61.24	2994T21	8.59
5/8"-11	60	0.88"	3.13"	4.71"	0.75"	1"	4,000	2994T67	63.60	2994T22	10.00
5/8"-11	60	0.88"	3.13"	4.71"	0.75"	1.25"	4,000	2994T68	63.60	2994T23	10.00
3/4"-10	100	0.88"	3.13"	4.71"	0.75"	1"	5,000	2994T71	66.08	2994T25	12.66
3/4"-10	100	0.88"	3.13"	4.71"	0.75"	1.50"	5,000	2994T72	124.67	2994T26	14.54
3/4"-10	100	1.40"	5.10"	7"	1"	1.20"	7,000	2994T73	126.78	2994T27	15.56
3/4"-10	100	1.40"	5.10"	7"	1"	1.70"	7,000	2994T74	126.78	2994T28	20.00
7/8"-9	160	1.40"	5.10"	7"	1"	1.20"	8,000	2994T75	129.33	2994T29	22.62
1"-8	230	1.40"	5.10"	7"	1"	1.45"	10,000	2994T76	131.53	2994T31	23.22
1"-8	230	1.40"	5.10"	7"	1"	1.70"	10,000	2994T77	131.53	2994T32	31.30
1"-8	230	1.40"	5.10"	7"	1"	2.45"	10,000	2994T78	207.90	2994T33	60.59
1 1/4"-7	470	2"	6.75"	9.22"	1.25"	2.63"	15,000	2994T82	222.48	2994T34	95.38
1 3/4"-6	670	2"	6.75"	9.22"	1.25"	2.63"	24,000	2994T83	239.49	2994T35	105.15
1 1/2"-6	800	2"	6.75"	9.22"	1.25"	2.63"	7,000	2994T57	39.55	●	●
Metric Drawn Steel Hoist Rings											
Bolt Size	Thread Torque, kg/m	A	C	D	E	L	Work Load Limit, kg				
M8 x 1.25mm	1.0	10.9	46.7	67.8	9.7	12.5	400	2994T41	49.04	2994T61	12.27
M10 x 1.50mm	1.7	10.9	46.7	67.8	9.7	17.5	450	2994T42	49.04	2994T62	12.27
M12 x 1.75mm	3.8	22.4	89.4	121.4	19.0	19.0	1,050	2994T43	59.70	2994T63	14.66
M16 x 2.00mm	8.2	22.4	89.4	121.4	19.0	29.0	1,900	2994T44	61.46	2994T64	17.03
M20 x 2.50mm	13.6	22.4	89.4	121.4	19.0	34.0	2,150	2994T45	63.32	2994T65	21.89
M24 x 3.00mm	31.0	35.6	130.6	165.6	25.4	37.0	4,200	2994T47	156.72	2994T67	33.82
M30 x 3.50mm	60.0	44.5	165.1	221.7	31.7	41.9	7,000	2994T48	275.54	2994T68	39.55

• To Order Please ask for 3052T999 and specify bolt size.
 NEVER EXCEED WORK LOAD LIMITS
McMASTER-CARR

Low Profile Translation Stages

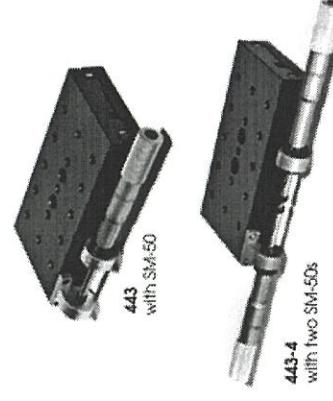
Model 423, 433 and 443 Series



Models 423, 433, and 443 feature exceptional performance, usability, and value with precision ball bearing construction, hardened balls rolling between opposing pairs of hardened and polished stainless steel rods. For stability, repeatability, and exceptionally smooth motion, actuators bear upon a hardened carbide insert. Springs provide preload against the actuator tip to eliminate backlash.

Stable stainless steel actuator mounting system allows your choice of Newport's manual or motorized actuators to be attached in either a right or left hand configuration. A non-influencing lock (also reversible for left handed configurations) similar to those used on our top of the line ULTRAlign Series provides positive stable positioning and guards against inadvertent adjustments.

For higher load capacity, see 426 and 436 Series crossed roller low profile stages, or our double row ball bearing UMR Series stages.

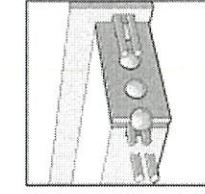


BACK

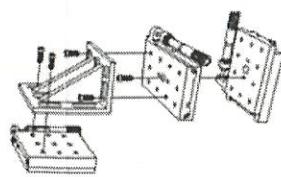
NEXT

Key Features:

- Most models lockable
- Precision ball bearing movements
- Reversible for left or right hand applications
- Compatible with Newport manual and motorized actuators
- Stackable for low profile multi-axis positioning
- Up to 4 inch (102 mm) travel



Stackable

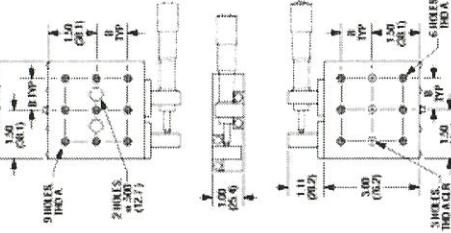


Models 360-90 and 360-30 can be used to make long-travel XYZ stages using linear stages like our Models 423, 433, 443, 426 or 436.

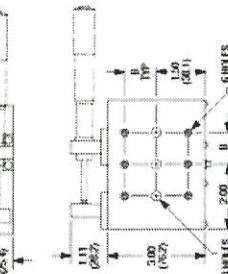
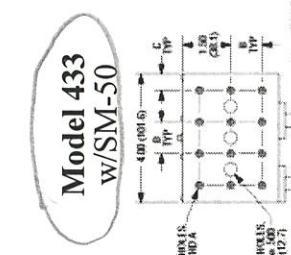
Opto-Mechanical Drawings

Model 423

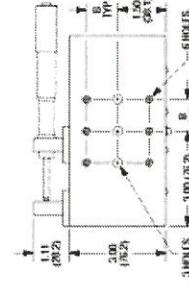
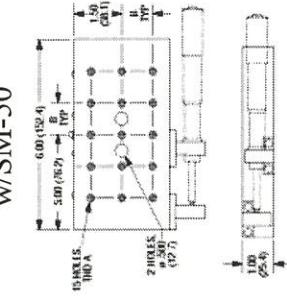
W/SM-13

**Model 433**

W/SM-50

**Model 443**

W/SM-50



MODEL	THREAD			DIMENSION INCHES
	A	B	C	
423	ENGLISH	1/4-20	1.000	-
433		1/4-20	1.000	.50
443		1/4-20	1.000	-
	METRIC			MILLIMETERS
M-423	M6		25.0	-
M-433	M6		25.0	13.3
M-443	M6		25.0	-

BACK

NEXT

STAGE FOR GUIDE CAMERA ON TOP BOX FOR 90^h BOK TELESCOPE

LINEAR BALL SCREW STAGES

ATS0300 Series

- Precision-ground, high-accuracy lead screw
- Ultra-fine resolution
- Crossed-roller bearings for high load capacity and smooth motion
- Includes cogless, brushless servomotor
- Compact profile



The ATS0300 provides an economical solution for applications requiring fine positioning in a confined area.

Construction Features

The ATS0300 series stages feature bases made from a special alloy aluminum tooling plate for good stiffness and long-term stability. Other high quality features are crossed-roller linear bearings for smooth travel and excellent payload characteristics, a precision-ground

lead screw for high accuracy, and Teflon-impregnated hardcoat treated base and table for high resistance to marring and scratching. Table mounting holes have Helicoil® stainless steel inserts to permit multiple screw insertions without thread wear.

The ATS0300's precision-ground lead screw is available in both metric and English leads. A fine pitch screw results in submicron resolution.

Multi-Axis Combinations

ATS0300 series stages are easily configured in XY, XZ, or XYZ arrangements. The precision-machined HDZ3 right angle L-bracket is designed for Z-axis applications, and the HDT3 bracket is ideal for lower profile configurations.

Options

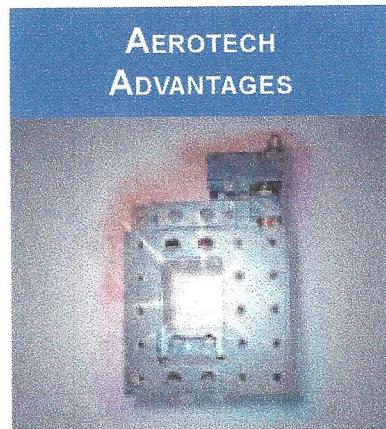
Both metric and English mounting and bolt hole patterns are available.

A large thru-hole aperture version is available, which is ideal for applications requiring backlighting. As is the case with all ATS series stages, the ATS03005 may be vacuum prepared to 10⁻⁶ torr.

Motors and Drives

The standard motor included with the ATS03005 is Aerotech's BMS series brushless, slotless motor. This motor utilizes an ironless design so there is no cogging, which results in no torque ripple throughout the range of motion.

Aerotech's wide range of amplifiers and controllers range from easy-to-use point-to-point indexers, to sophisticated multi-axis contouring controllers. Form factors include stand-alone controllers with RS-232 and IEEE-488 interfaces to advanced PC-bus based controllers.



AEROTECH ADVANTAGES

A large thru-hole aperture option allows for backlighting, making the ATS0300 ideal for inspection applications.

LINEAR BALL SCREW STAGES

Accuracy	Good		
Load (kg)	25kg		
Travel (mm)	50mm		



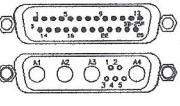
WORLD HEADQUARTERS: Aerotech, Inc., 101 Zeta Drive, Pittsburgh, PA 15238, USA 412-963-7470 Fax: 412-963-7455 www.aerotechinc.com
 Aerotech, Ltd., Jupiter House, Calleva Park, Aldermaston, Berkshire RG7 8NN, UK 44-118-9409400 Fax: 44-118-981502 www.aerotech-europe.com
 Aerotech GmbH, Süd-West-Park 90, D-90449 Nürnberg, Germany 49-911-9679370 Fax: 49-911-9679372 www.aerotech-europe.com

ATS0300 Series Linear Ball Screw Stage Specifications

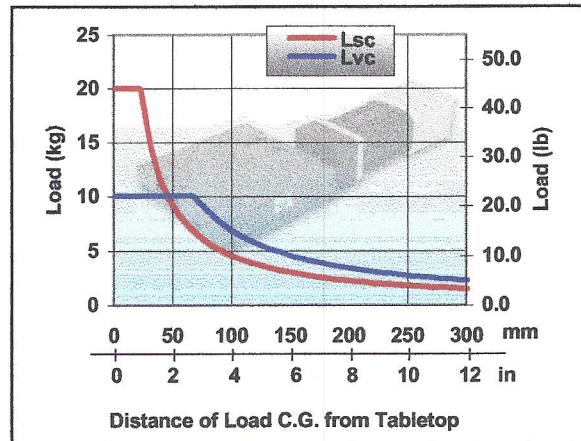
BASIC MODEL		ATS03005
Total Travel		50mm (2 in)
System		Precision ground lead screw
Resolution	0.5 mm/rev Lead	0.125 μm (5 μin) @ 4000 steps/rev motor resolution
	0.025 in/rev Lead	0.16 μm (6 μin) @ 4000 steps/rev motor resolution
Maximum Travel Speed		4 mm/s (0.2 in/s)
Maximum Load ⁽¹⁾	Horizontal	25.0 kg (55.1 lb)
	Vertical	9.0 kg (19.8 lb)
	Side	9.0 kg (19.8 lb)
Accuracy		2.5 μm /25 mm (100 $\mu\text{in}/\text{in}$)
Repeatability	Unidirectional	0.3 μm (12 μin)
	Bidirectional	1.0 μm (40 μin)
Straightness & Flatness		2.5 μm /25 mm (100 $\mu\text{in}/\text{in}$)
Nominal Stage Weight	Less Motor	1.4 kg (3.1 lb)
	With Motor	2.5 kg (5.5 lb)
Material		Aluminum
Finish		Hard Coating (62 Rockwell Hardness Teflon Impregnated)

Note: 1. Payload specifications are for single axis system and based on ball screw and bearing life of 250 km (10 million inches) of travel.

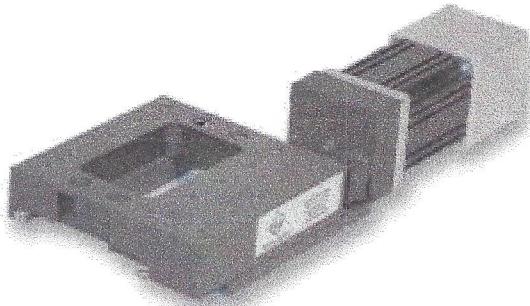
STANDARD MOTOR INFORMATION

CODE	TYPE	MODEL	BUS	AMPS	CABLE	DRIVER	CONNECTOR(S)
-BMS (default)	Brushless Servo	BMS60-A-D25-E1000H	up to 160 VDC	up to 1.8 A _{rms} Cont up to 7.3 A _{rms} Peak	BMCHPD / BFCD	U511 / DR500 / DR600	
					PMCHPD / BFCD	BB501 + BA	
					PMCHPD / BFCD	BAI	
					BMP2HPD / BFCD	U100Z	
-DC	DC Servo	1035LT-MSOF-E1000LD	40 VDC	up to 4.1 A Cont up to 8.2 A Peak	DC-MSO	U511 / DR500 / DR600	
					BADC-MSO1	BB501 + BA	
					BADC-MSO1	BAI	
					DCC	U100S	
-SM	Microstepping	50SMB2-HM	40 VDC	up to 1 A	SMS-O	U511 / DR500 / DR600	
					SMC	U100M	

No Driver



L_{vc} and L_{sc} Cantilevered Load Capability (ATS0300)

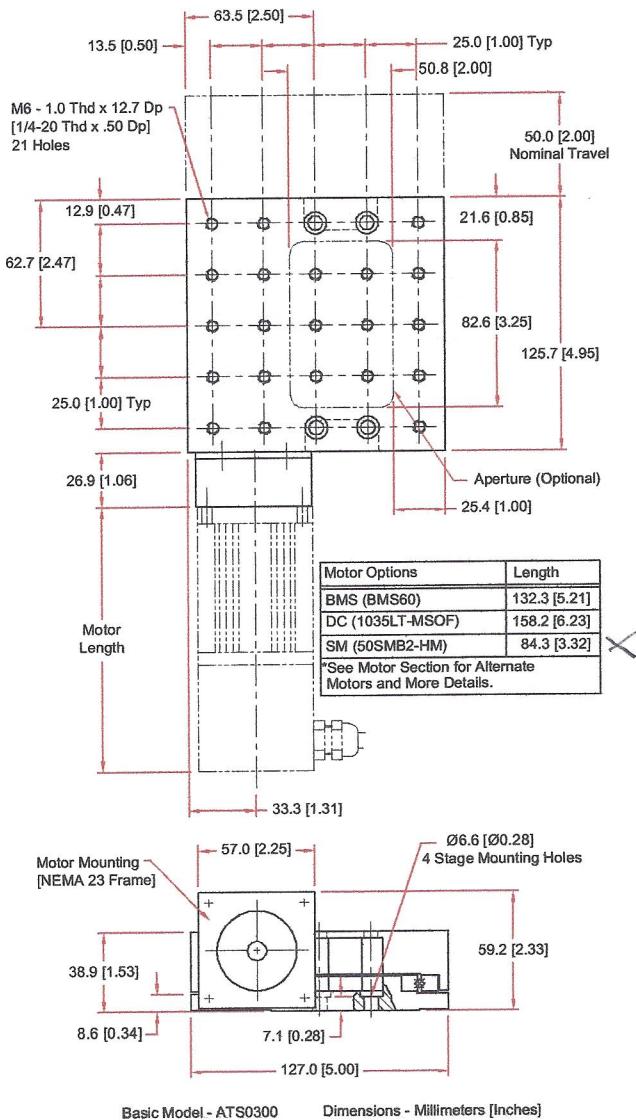


Options include metric or English mounting and large thru-hole apertures.



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 Aerotech GmbH, Süd-West-Park 90, D-90449 Nürnberg, Germany 49-911-9679370 Fax:49-911-9679372 www.aerotech-europe.com

ATS0300 Series Linear Ball Screw Stage Dimensions



LINEAR BALL SCREW STAGES



CADs can be downloaded from our web site.

**RESEARCH &
DEVELOPMENT**

We constantly improve
the quality and performance
of our products. Please
check our web site for the
most current specifications.



WORLD HEADQUARTERS: Aerotech, Inc., 101 Zeta Drive, Pittsburgh, PA 15238, USA 412-963-7470 Fax:412-963-7455 www.aerotechinc.com
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U
A + S - 005 - M - 0025 - SM

\$2195 + 260

ATS0300 Series Linear Ball Screw Stage Ordering

ORDERING EXAMPLE: ATS03 - 005 - M - 5 - BMS

ATS03	-005		-M	-5	-BMS
Series	Travel (mm)	Stage Construction Options	Mounting and Grid Pattern	Drivescrew	Motor
	-005	/VAC3 /VAC6	-M -U -MA -UA	-0025 -5	-BMS -DC -SM -NM

ATS0300 Series Linear Ball Screw Stage

ATS03005 50 mm (2 in) travel stage with ground lead screw and limits

Stage Construction Options

/VAC3 Vacuum preparation of stage to 10^{-3} torr.

/VAC6 Vacuum preparation of stage to 10^{-6} torr.

Mounting and Grid Pattern

- M Metric dimension mounting pattern and holes
- U English dimension mounting pattern and holes
- MA Metric dimension mounting pattern and holes with aperture tabletop and base
- UA English dimension mounting pattern and holes with aperture tabletop and base

Drivescrew

- 0025 0.025 in/rev drivescrew lead
- 5 0.5 mm/rev drivescrew lead

Motor

- BMS Brushless servo motor with connectors and 1000-line encoder. Requires cable. (BMS60-A-D25-E1000H/)
- DC DC servo motor with connector and 1000-line encoder. Requires cable. (1035LT-MSOF-E1000LD/)
- SM Stepping motor with connector and home marker pulse (one per rev). Requires cable. (50SMB2-HM/)
- NM No motor or encoder

Accessories (to be ordered as separate line item)

- ALIGNMENT-NPA Non-precision XY assembly
- ALIGNMENT-NPAZ Non-precision XZ or YZ assembly
- ALIGNMENT-PA10 XY assembly; 10 arc sec orthogonal
- ALIGNMENT-PA10Z XZ or YZ assembly with L-bracket; 10 arc second orthogonal
- ALIGNMENT-PA5 XY assembly; 5 arc sec orthogonal
- ALIGNMENT-PASZ XZ or YZ assembly with L-bracket; 5 arc second orthogonal
- HDZ3 English right angle L-bracket
- HDZ3M Metric right angle L-bracket
- HDZ3A English right angle L-bracket with aperture
- HDZ3AM Metric right angle L-bracket with aperture
- HDT3 English low profile right angle L-bracket
- HDT3M Metric low profile right angle L-bracket
- HDT3A English low profile right angle L-bracket with aperture
- HDT3AM Metric low profile right angle L-bracket with aperture

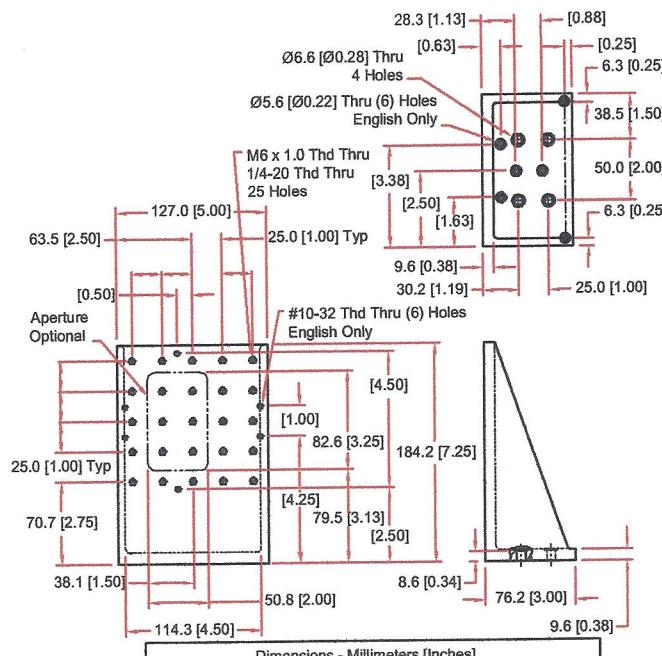
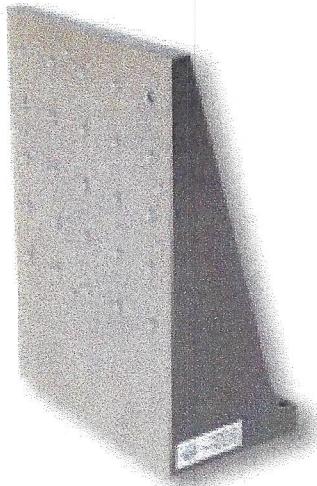
LINEAR BALL SCREW STAGES



WORLD HEADQUARTERS: Aerotech, Inc., 101 Zeta Drive, Pittsburgh, PA 15238, USA 412-963-7470 Fax:412-963-7455 www.aerotechinc.com
Aerotech, Ltd., Jupiter House, Calleva Park, Aldermaston, Berkshire RG7 8NN, UK 44-118-9409400 Fax:44-118-981502 www.aerotech-europe.com
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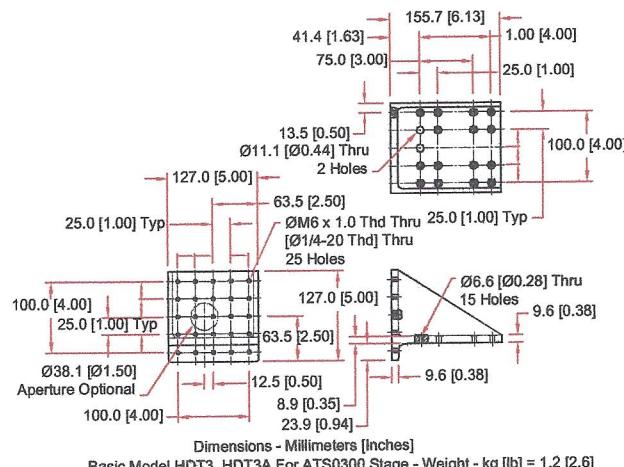
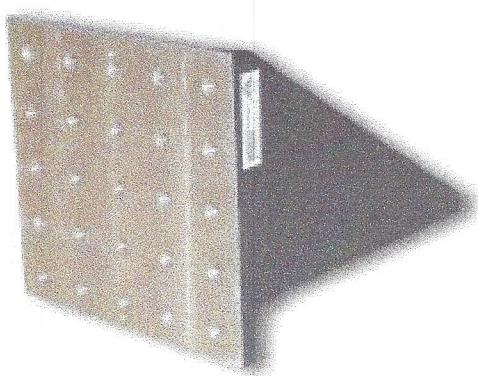
ATS0300 Series Linear Ball Screw Stage Dimensions

HDZ3 Bracket



LINEAR BALL SCREW STAGES

HDT3 Bracket



FILTER WHEEL For GUIDE CAMERA

OPIEL
INSTRUMENTS MOTORIZED FILTER WHEELS



Filter interchange is quick and easy in our new Motorized Filter Wheel Systems.

- Remote filter selection via computer or TTL controller
- Hold 6 filters simultaneously
- Easy and quick filter insertion and removal
- Thin profile

These new filter wheel systems hold up to six 1.0 inch (25.4 mm) diameter filters or apertures. The clear aperture is 0.87 inch (22 mm). Use a filter wheel as a low cost monochromator, with narrow or broad bandpass filters; as a variable attenuator with neutral density filters; or to hold order sorting filters for your monochromator.

QUICK AND EASY FILTER INSERTION

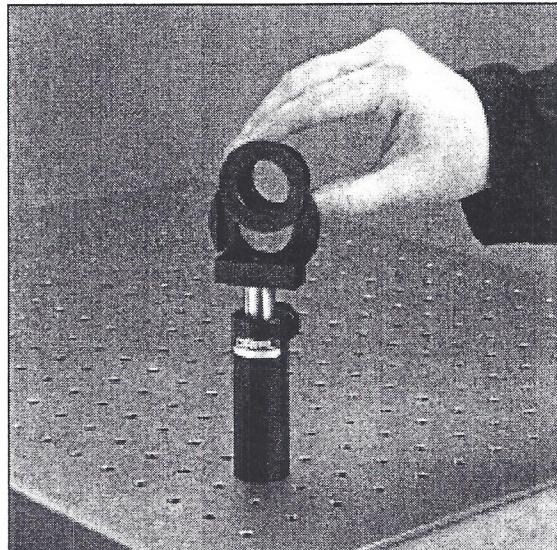
The filter wheel has a unique design. Each of the six positions holds a filter holder that snaps in and out of place, and is accessed from the top of the wheel. This means that you can mount all your 1 inch filters in the holders, and have them ready for quick insertion into the wheel. We include six filter holders with each wheel; others are available separately, under model 74011.

OPTIONAL ROD MOUNT

The 74012 Rod Mount holds a single 74011 Filter Holder atop an optical rod, for use anywhere in your lab. A 1 inch (25.4 mm) long optical rod is included with the 74012. (The 74012 includes a 74011 Filter Holder.)

OPTIONAL FLANGE MOUNT

The 74013 is a 74011 Filter Holder Assembly inside our 62020 Flanged Holder. It is a convenient filter mount to place in the middle of an optical path. The flanges on the 62020 couple to male or female 1.5 inch Series Components, and the filters snap in and out of the 62020 without breakdown of your set-up. See page 1-164 for more details, and a dimensional diagram of the 62020.



74012 Rod Mount with 74011 Filter Holder

TWO MODELS OF CONTROLLERS

We offer two filter wheel systems; the only difference is the controller.

- 74040 Low Cost TTL Filter Wheel System
- 74041 RS-232 and IEEE-488 (GPIB) Filter Wheel System

Low Cost TTL Filter Wheel System

The 74040 uses a simple TTL controller to drive and command the filter wheel. A TTL signal moves the filter wheel to the next position. The TTL signal is accessed via a BNC connector on the control box.

The controller has a manual "forward" button which moves the filter wheel to the next position. A display shows the current filter position.

RS-232 and IEEE-488 Filter Wheel System

Choose the 74041 if you are integrating the filter wheel into an optical system using other instruments (i.e. monochromator, detector), or if you simply want PC control of your filter wheel. The 74041's controller has RS-232 and IEEE-488 (GPIB) computer interfaces and a manual "forward" button which moves the filter wheel to the next position.

Command Set and LabView™ VIs Included

We include software development tools with the 74041 to facilitate the writing of your own filter wheel control program. These are:

- Command Set (similar to BASIC program commands)
- LabView™ VIs for RS-232 and IEEE-488

Lenses

Filters

Polarization
Optics

Windows,
Substrates & Mirrors

Prisms &
Beam Splitters

Optical Coatings

Properties of
Optical Materials

E-MAIL RES-SALES@OPIEL.COM



MOTORIZED FILTER WHEELS

FOR AUTOMATED MONOCHROMATORS...

If you're using an Oriel Cornerstone™ or MS257™ Monochromator, choose the dedicated filter wheels described on the individual monochromator pages. Those filter wheels do not require a controller or power supply; the monochromator and its controls provide the necessary power and commands.

MOUNTING

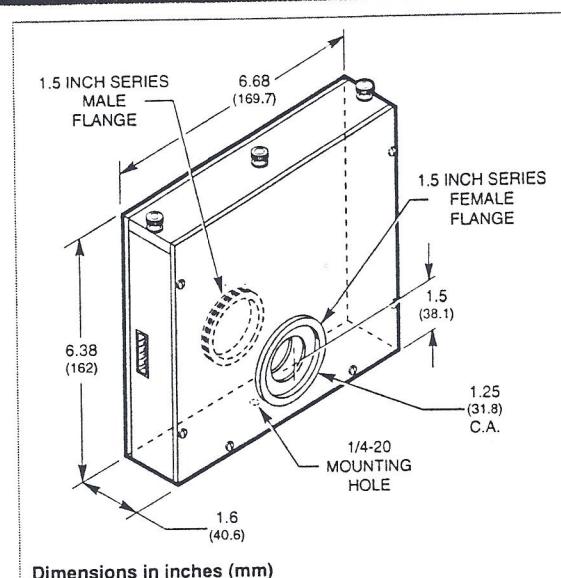
The filter wheel has a 1/4-20 tapped hole for rod mounting, and 1.5 Inch Series male and female flanges for coupling directly to Oriel instruments, such as detector housings, lamp housings and monochromators.

SPECIFICATIONS

Filter dimensions:

Diameter:	1.0 inch (25.4 mm)
Min. thickness*:	0.1 inch (2.5 mm)
Max. thickness:	0.4 inch (10.2 mm)
Filter changeover time:	<2 s for adjacent positions

* For filters less than 0.1 inch (2.5 mm) thick, order the 77366 Filter Spacer.



Dimensions in inches (mm)

Fig. 2 Dimensional diagram of Motorized Filter Wheel.

ORDERING INFORMATION

74040	Low Cost TTL Filter Wheel System
74041	RS-232 and IEEE-488 Filter Wheel System
74012	Rod Mount for 74011 Filter Holder (one 74011 is included)
74013	Flanged Filter Mount
74011	Filter Holder (six are included with filter wheel systems)
77366	Filter Spacer Holds filters less than 2.5 mm thick in the Filter Wheel (and 74011 Filter Holder)

See these pages...

Colored Glass Filters	page 10-4
Neutral Density Filters	page 10-18
Narrow Bandpass Filters	page 10-33
Broad Bandpass Filters	page 10-38
Long Pass and Short Pass Filters	page 10-41

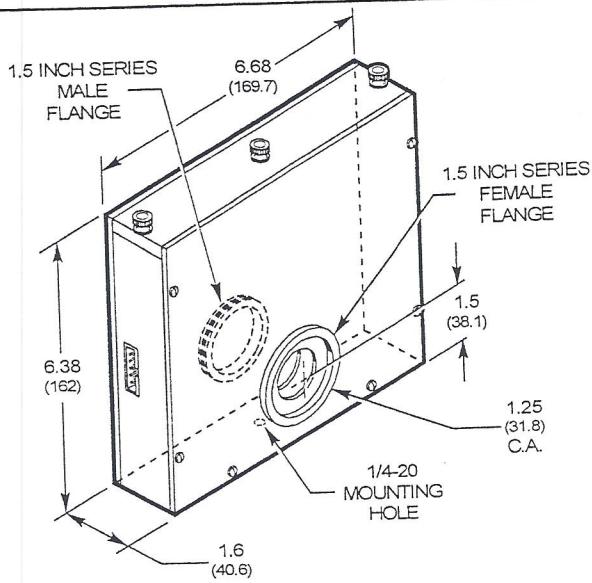


Fig. 1 Dimensional diagram of 74041 Filter Wheel Head.

Flange Mounting

Fig. 1 shows a diagram of the Filter Wheel Head. One side has a 1.5 Inch Series Female flange, the other side has a 1.5 Inch Series male flange. You can mount the wheel directly to an Oriel instrument or component via one of the flanges. To flange mount the Filter Wheel Head:

1. Identify the flange of the Oriel component/instrument to which you will mate the Filter Wheel.
2. If you are using the Filter Wheel Head's female flange, loosen the set screws on this flange. If you are using the Filter Wheel Head's male flange, loosen the set screws on the mating component's female flange.
3. Fit the flanges of the two components together and tighten the set screws.

Rod Mounting

Rod mounting lets you place the Filter Wheel Head almost anywhere on an optical table with $\frac{1}{4}$ -20 hole pattern. To rod mount the Filter Wheel Head:

1. Turn the Filter Wheel Head upside-down, and remove the center set screw on the bottom plate (refer to Fig. 1).
2. Attach a $\frac{1}{4}$ -20 optical rod and insert the rod mounted Filter Wheel Head into a rod holder which should already be secured to your optical table or baseplate.

NEW!

Filter interchange is quick and easy in our new Motorized Filter Wheel Systems.

- Remote filter selection via computer or TTL controller
- Hold 6 filters simultaneously
- Easy and quick filter insertion and removal
- Thin profile

These new filter wheel systems hold up to six 1.0 inch (25.4 mm) diameter filters or apertures. The clear aperture is 0.87 inch (22 mm). Use a filter wheel as a low cost monochromator, with narrow or broad bandpass filters; as a variable attenuator with neutral density filters; or to hold order sorting filters for your monochromator.

QUICK AND EASY FILTER INSERTION

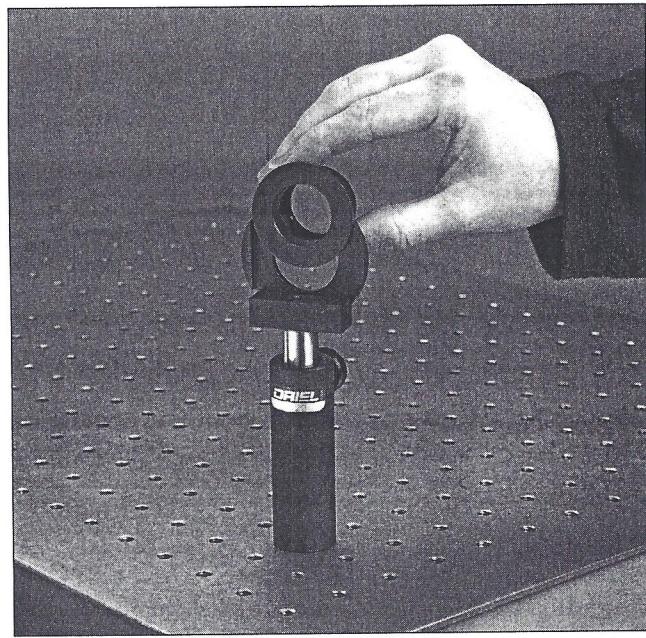
The filter wheel has a unique design. Each of the six positions holds a filter holder that snaps in and out of place, and is accessed from the top of the wheel. This means that you can mount all your 1 inch filters in the holders, and have them ready for quick insertion into the wheel. We include six filter holders with each wheel; others are available separately, under model 74011.

OPTIONAL ROD MOUNT

The 74012 Rod Mount holds a single 74011 Filter Holder atop an optical rod, for use anywhere in your lab. A 1 inch (25.4 mm) long optical rod is included with the 74012. (The 74012 includes a 74011 Filter Holder.)

OPTIONAL FLANGE MOUNT

The 74013 is a 74011 Filter Holder Assembly inside our 62020 Flanged Holder. It is a convenient filter mount to place in the middle of an optical path. The flanges on the 62020 couple to male or female 1.5 inch Series Components, and the filters snap in and out of the 62020 without breakdown of your set-up. See page 1-164 for more details, and a dimensional diagram of the 62020.



74012 Rod Mount with 74011 Filter Holder

TWO MODELS OF CONTROLLERS

We offer two filter wheel systems; the only difference is the controller.

- 74040 Low Cost TTL Filter Wheel System
- 74041 RS-232 and IEEE-488 (GPIB) Filter Wheel System

Low Cost TTL Filter Wheel System

The 74040 uses a simple TTL controller to drive and command the filter wheel. A TTL signal moves the filter wheel to the next position. The TTL signal is accessed via a BNC connector on the control box.

The controller has a manual "forward" button which moves the filter wheel to the next position. A display shows the current filter position.

RS-232 and IEEE-488 Filter Wheel System

Choose the 74041 if you are integrating the filter wheel into an optical system using other instruments (i.e. monochromator, detector), or if you simply want PC control of your filter wheel. The 74041's controller has RS-232 and IEEE-488 (GPIB) computer interfaces and a manual "forward" button which moves the filter wheel to the next position.

Command Set and LabView™ VIs Included

We include software development tools with the 74041 to facilitate the writing of your own filter wheel control program. These are:

- Command Set (similar to BASIC program commands)
- LabView™ VIs for RS-232 and IEEE-488

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Filters

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Beam Splitters

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Properties of
Optical Materials

FOR AUTOMATED MONOCHROMATORS...

If you're using an Oriel Cornerstone™ or MS257™ Monochromator, choose the dedicated filter wheels described on the individual monochromator pages. Those filter wheels do not require a controller or power supply; the monochromator and its controls provide the necessary power and commands.

MOUNTING

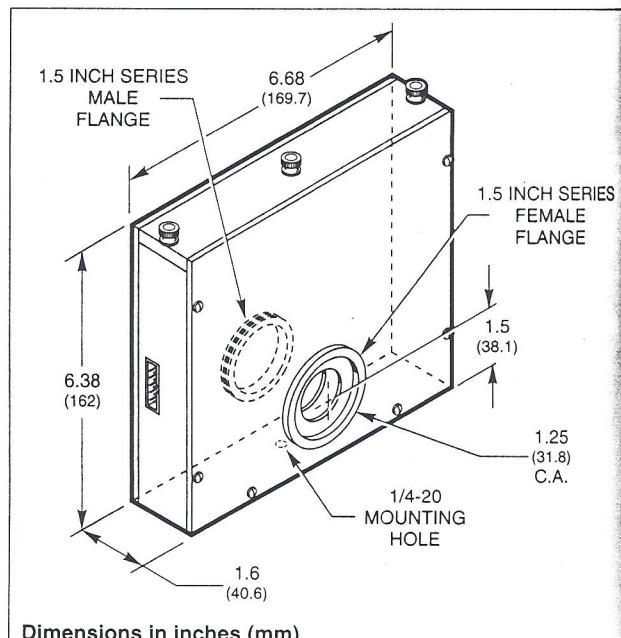
The filter wheel has a 1/4-20 tapped hole for rod mounting, and 1.5 Inch Series male and female flanges for coupling directly to Oriel instruments, such as detector housings, lamp housings and monochromators.

SPECIFICATIONS

Filter dimensions:

Diameter:	1.0 inch (25.4 mm)
Min. thickness*:	0.1 inch (2.5 mm)
Max. thickness:	0.4 inch (10.2 mm)
Filter changeover time:	<2 s for adjacent positions

* For filters less than 0.1 inch (2.5 mm) thick, order the 77366 Filter Spacer.



Dimensions in inches (mm)

Fig. 2 Dimensional diagram of Motorized Filter Wheel.

ORDERING INFORMATION

74040	Low Cost TTL Filter Wheel System	\$ 1,225.00
74041	RS-232 and IEEE-488 Filter Wheel System	\$ 1,795.00
74012	Rod Mount for 74011 Filter Holder	\$ 131.00 (one 74011 is included)
74013	Flanged Filter Mount.....	\$ 101.00
74011	Filter Holder.....	\$ 37.00 (six are included with filter wheel systems)
77366	Filter Spacer	\$ 12.00 Holds filters less than 2.5 mm thick in the Filter Wheel (and 74011 Filter Holder)

Also see these pages...
See the following pages for some of our filters

Colored Glass Filters	page 10-4
Neutral Density Filters	page 10-18
Narrow Bandpass Filters	page 10-33
Broad Bandpass Filters	page 10-38
Long Pass and Short Pass Filters	page 10-41

FROM : SHERWIN WILLIAMS

PHONE NO. : 602 276 4601

May. 21 2001 10:02AM PJ



PAINT SPEC FOR LENS CAN
PRATT & LAMBERT INDUSTRIAL COATINGS DIVISION
90° PRIME Focus
PRODUCT INFORMATION

723400 PRIMER COATING COL.V

MIXING / REDUCTION (continued)**CURE**

Product will be dry hard (ASTM 1610) in 15 minutes.
 Product may be handled or recoated at 15 minutes.
 Final cure will occur after 72 hours.

EQUIPMENT CLEANUP

XYLOL OR TOLUOL

Post-it® Fax Note	7671	Date	4-21-01	# of pages	16
To	Karen Kenney	From	Todd Dillig		
Co./Dept.		Co.	All Pro Ind.		
Phone #		Phone #	480-968-1947		
Fax #	1-520-621-1578	Fax #	480-968-5349		

OK to change Paint
 Russ Warner 5/21/01

$\phi 22,000$

$\phi 16,000$

face seal glands

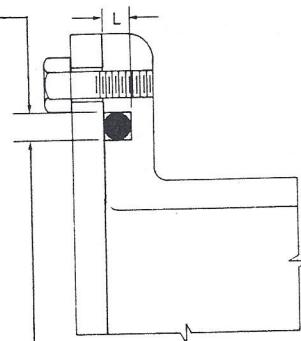
PARKER.COM
07/06

.104

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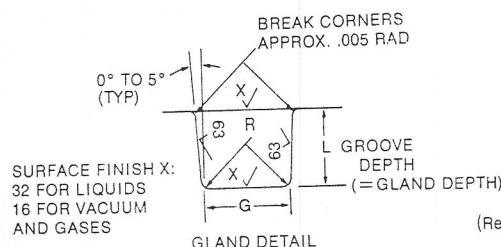
FOR INTERNAL PRESSURE
(outward pressure direction)
dimension the groove by its
outside diameter (H_o) and width:

H_o = Mean O.D. of O-ring
(see Table A5-1)
Tolerance = Minus 1% of Mean
O.D., but not more than
.060



FOR EXTERNAL PRESSURE
(inward pressure direction)
dimension the groove by its
inside diameter (H_i) and width:

H_i = Mean I.D. of O-ring
(see Table A5-1)
Tolerance = Plus 1% of Mean
I.D., but not more than
.060.

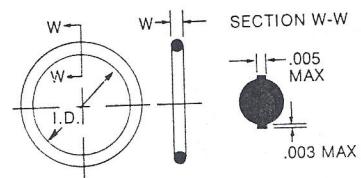


(Refer to design chart A5-2 below)

DESIGN CHART A5-2

FOR O-RING FACE SEAL GLANDS

These dimensions are intended primarily for face type seals and low temperature applications.



O-RING SIZE PARKER NO. 2	CROSS SECTION		GLAND DEPTH	SQUEEZE		GROOVE WIDTH		GROOVE RADIUS
	NOMINAL	ACTUAL		ACTUAL	%	Liquids	Vacuum and Gases	
004 through 050	1/16	.070 $\pm .005$.050 to .054	.013 to .023	19 to 32	.101 to .107	.083 to .088	.005 to .015
102 through 178	3/32	.103 $\pm .003$.074 to .080	.020 to .032	20 to 30	.136 to .142	.118 to .123	.005 to .015
201 through 284	1/8	.139 $\pm .004$.101 to .107	.028 to .042	20 to 30	.177 to .187	.157 to .163	.010 to .025
309 through 395	3/16	.210 $\pm .005$.152 to .162	.043 to .063	21 to 30	.270 to .290	.236 to .241	.020 to .035
425 through 475	1/4	.275 $\pm .006$.201 to .211	.058 to .080	21 to 29	.342 to .362	.305 to .310	.020 to .035
Special	3/8	.375 $\pm .007$.276 to .286	.082 to .108	22 to 28	.475 to .485	.419 to .424	.030 to .045
Special	1/2	.500 $\pm .008$.370 to .380	.112 to .138	22 to 27	.638 to .645	.560 to .565	.030 to .045

Static

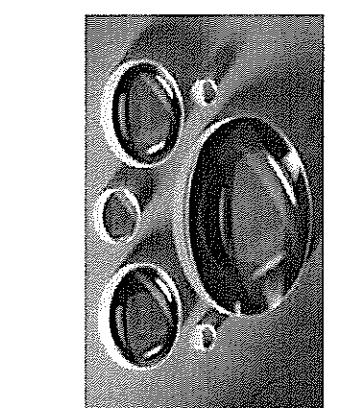
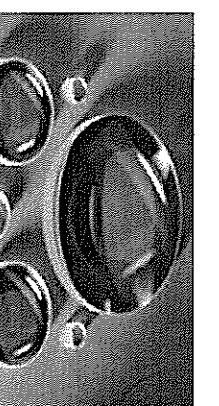
10° Prism to Box Glass LENS

BK 7 Precision Plano-Convex Lenses

Optics and Mechanics | Spherical Lenses | Motion Control | OEM Solutions

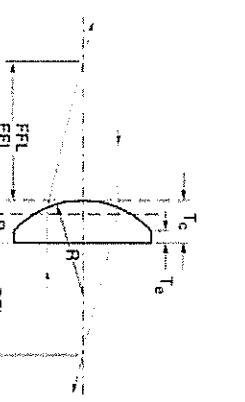
Product Selection

Home | Site Index | Contact Us



Specifications

Focal Length at 546.1 nm	$\pm 1\%$
Material	BK 7, grade A, fine annealed optical glass
Surface Accuracy	380-2100 nm, uncoated ≤ 3 fringes (1.5λ) power, 1/2 fringe ($\lambda/4$) irregularity at 546.1 nm over the clear aperture
Clear Aperture	≥ central 90% of diameter.
Surface Quality	40-20 scratch-dig ≤ 3 arc min
Centration	0-0.1 mm
Diameter	± 0.1 mm
Center Thickness (T_c)	3.0 mm, nominal
Edge Thickness (T_e)	0-0.8 mm face width x 45° ± 15°, typical
Chamfers	AR.14, AR.16, and AR.18; broadband, multilayer coating, $R_{avg} < 0.5\%$ per surface
Antireflection Coatings	AR.33: laser line, multilayer V-coat, $R_{max} < 0.5\%$ per surface at 1064 nm
Durability	MIL-C-675C, moderate abrasion
Cleaning	Non-abrasive method: acetone or isopropyl alcohol on lens tissue recommended in Care and Cleaning of Optics
Damage Threshold	AR coated: 100 W/cm² CW, 2 J/cm² with 10 nsec pulses, typical



Newport | Optics and Mechanics | Spherical Lenses | Singlet Lenses | BK 7 Precision Plano-Convex Lenses

Dia. (mm)	EFL (mm)	f# (mm)	BFL (mm)	FFL (mm)	P ₂ (mm)	T _c (mm)	R (mm)	Product Number
50.8	100	1.9	93.62	100	-6.37	9.673	51.68	KPX187
50.8	125	2.4	119.59	125	-5.40	8.203	64.6	KPX190
50.8	150	2.9	145.2	150	-4.79	7.279	77.52	KPX193
50.8	175	3.4	170.62	175	-4.37	6.64	90.44	KPX196
50.8	200	3.9	195.93	200	-4.06	6.17	103.36	KPX199
50.8	250	4.9	246.36	250	-3.64	5.521	129.2	KPX202
50.8	300	5.9	296.64	300	-3.35	5.095	155.040	KPX205
50.8	400	7.8	396.98	400	-3.01	4.566	206.72	KPX208
50.8	500	9.8	497.19	500	-2.80	4.251	258.4	KPX211
50.8	750	14.7	747.47	750	-2.52	3.833	387.6	KPX214
50.8	1000	19.6	997.61	1000	-2.39	3.625	516.8	KPX217
76.2	100	1.3	86.97	100	-13.02	19.763	51.68	KPX223
76.2	150	1.9	141.42	150	-8.57	13.009	77.52	KPX226
76.2	200	2.6	193.22	200	-6.77	10.27	103.36	KPX229
76.2	300	3.9	294.88	350	-5.11	7.754	155.04	KPX232
76.2	EFL	f/#	BFL	FFL	P ₂	T _c	R	Product Number
76.2	EFL	f/#	BFL	FFL	P ₂	T _c	R	Product Number
50.8	88.3	1.7	81.23	88.3	-7.06	10.722	45.633	KPX184

For 10° Prism Focus
PROJECT
GUIDER LENS

- Key Features
 - BK 7 optical glass
 - ≤ $\lambda/4$ surface irregularity
- Extensive selection
- PDF Files
 - KPXPrec.pdf 47 KB 02/01/00

MOTION INDUSTRIES
BUS: 520/882-6800
FAX: 520/882-6804



FROM: RAY DARLING

Attention:

DAVE / U of A

Date:

4-19-99

Fax number:

626 - 4330

Number of pages:

2

OBSOLETE

NOTE

1pc- ~~KD 160~~ X PO Brg. \$ 2626.83 EA

STK- KAYDON / Sumter S.C.

Fab - shipping point

DAVE,

RBC had no stock and no production date.
The bearing I'm quoting is KAYDON
(Spec sheet included)

Reference Quote# 27730

THANK YOU

Ray

Motion Industries
1802 E. Grant
Ste. 107
Tucson, AZ 85746

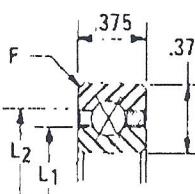
Bus: 520/882-6800



BEARING FOR
TOP BOX

KC SERIES

SNAPOVER
SEPARATOR
3/16" BALLS



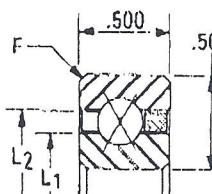
(2) F = .040

Bearing corners are normally chamfered

Bearing Number		Dimensions in Inches				Capacities (1)				Weight in Pounds
Current	Former	Bore	Outside Dia.	Land Dia. L ₁	Land Dia. L ₂	Radial in Lbs.	Thrust in Lbs.	Moment (Lbs-In.)		
						Static	Dyn.	Static	Dyn.	
•KC040XPO	KC40XP	4.000	4.750	4.277	4.473		860		2,130	1,890 .45
KC042XPO	KC42XP	4.250	5.00	4.527	4.723		900		2,240	2,070 .47
•KC045XPO	KC45XP	4.500	5.250	4.777	4.973		920		2,300	2,240 .48
KC047XPO	KC47XP	4.750	5.500	5.027	5.223		950		2,360	2,450 .50
•KC050XPO	KC50XP	5.000	5.750	5.277	5.473		990		2,470	2,610 .58
•KC055XPO	KC55XP	5.500	6.250	5.777	5.973		1,050		2,590	3,070 .59
•KC060XPO	KC60XP	6.000	6.750	6.277	6.473		1,100		2,760	3,520 .63
•KC065XPO	KC65XP	6.500	7.250	6.777	6.973		1,150		2,870	3,950 .68
•KC070XPO	KC70XP	7.000	7.750	7.277	7.473		1,210		3,050	4,450 .73
KC075XPO	KC75XP	7.500	8.250	7.777	7.973		1,260		3,160	4,980 .78
•KC080XPO	KC80XP	8.000	8.750	8.277	8.473	(3)	1,320	(3)	3,330	(3) 5,540 .84
•KC090XPO	KC90XP	9.000	9.750	9.277	9.473		1,440		3,560	6,740 .94
•KC100XPO	KC100XP	10.000	10.750	10.277	10.473		1,490		3,790	7,750 1.06
•KC110XPO	KC110XP	11.000	11.750	11.277	11.473		1,610		4,080	9,150 1.16
•KC120XPO	KC120XP	12.000	12.750	12.277	12.473		1,720		4,310	10,670 1.25
KC140XPO	KC140XP	14.000	14.750	14.277	14.473		1,900		4,770	13,560 1.52
•KC160XPO	KC160XP	16.000	16.750	16.277	16.473		2,070		5,170	16,900 1.73
KC180XPO	KC180XP	18.000	18.750	18.277	18.473		2,240		5,630	20,580 1.94
KC200XPO	KC200XP	20.000	20.750	20.277	20.473		2,410		6,030	24,600 2.16
KC250XPO	KC250XP	25.000	25.750	25.277	25.473		2,760		6,950	31,940 2.69
KC300XPO	KC300XP	30.000	30.750	30.277	30.473		3,100		7,870	47,130 3.21

KD SERIES

SNAPOVER
SEPARATOR
1/4" BALLS



(2) F = .060

Bearing corners are normally chamfered

Bearing Number		Dimensions in Inches				Capacities (1)				Weight in Pounds
Current	Former	Bore	Outside Dia.	Land Dia. L ₁	Land Dia. L ₂	Radial in Lbs.	Thrust in Lbs.	Moment (Lbs-In.)		
						Static	Dyn.	Static	Dyn.	
•KD040XPO	KD40XP	4.000	5.000	4.370	4.630		1,330		3,390	2,990 .78
•KD042XPO	KD42XP	4.250	5.250	4.620	4.880		1,390		3,450	3,310 .83
•KD045XPO	KD45XP	4.500	5.500	4.870	5.130		1,450		3,630	3,630 .88
KD047XPO	KD47XP	4.750	5.750	5.120	5.380		1,460		3,690	3,810 .94
•KD050XPO	KD50XP	5.000	6.000	5.370	5.630		1,510		3,880	4,170 1.00
•KD055XPO	KD55XP	5.500	6.500	5.870	6.130		1,630		4,120	4,900 1.06
•KD060XPO	KD60XP	6.000	7.000	6.370	6.630		1,700		4,300	5,510 1.16
•KD065XPO	KD65XP	6.500	7.500	6.870	7.130		1,820		4,540	6,360 1.22
•KD070XPO	KD70XP	7.000	8.000	7.370	7.630		1,880		4,780	7,030 1.31
•KD075XPO	KD75XP	7.500	8.500	7.870	8.130		2,000		4,960	7,990 1.41
•KD080XPO	KD80XP	8.000	9.000	8.370	8.630	(3)	2,060	(3)	5,150	(3) 8,740 1.53
•KD090XPO	KD90XP	9.000	10.000	9.370	9.630		2,240		5,590	10,640 1.72
•KD100XPO	KD100XP	10.000	11.000	10.370	10.630		2,360		5,930	12,350 1.88
•KD110XPO	KD110XP	11.000	12.000	11.370	11.630		2,540		6,360	14,650 2.06
•KD120XPO	KD120XP	12.000	13.000	12.370	12.630		2,660		6,720	16,590 2.25
•KD140XPO	KD140XP	14.000	15.000	14.370	14.630		2,970		7,390	21,550 2.73
KD160XPO	KD160XP	16.000	17.000	16.370	16.630		3,210		8,050	26,520 3.10
•KD180XPO	KD180XP	18.000	19.000	18.370	18.630		3,450		8,720	31,970 3.48
KD200XPO	KD200XP	20.000	21.000	20.370	20.630		3,690		9,320	37,900 3.85
•KD250XPO	KD250XP	25.000	26.000	25.370	25.630		4,300		10,780	54,850 4.79
KD300XPO	KD300XP	30.000	31.000	30.370	30.630		4,840		12,110	73,860 5.73

NOTE: * Available from stock - check for availability of other sizes. X - limited availability.

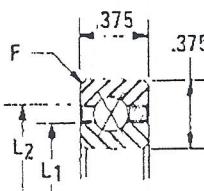
① Capacities listed are not simultaneous. For combined loading see discussion of Bearing Selection and Load Analysis. Dynamic capacities are based upon 500 hours L₁₀ life @ 33 1/3 RPM (1.0 million revolutions). Moment capacities are in pound-inches.

② "F" is the maximum shaft or housing fillet radius the bearing corners will clear.

③ Consult Kaydon for static capacity ratings.

KC SERIES

SNAPOVER
SEPARATOR
3/16" BALLS



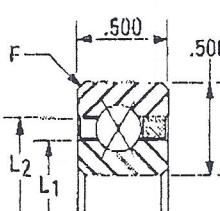
② F = .040

Bearing corners are normally chamfered

Bearing Number		Dimensions in Inches				Capacities ①						Weight in Pounds	
Current	Former	Bore	Outside	Land	Land	Radial in Lbs.		Thrust in Lbs.		Moment (Lbs-In)		Pounds	
			Dia.	Dia. L ₁	Dia. L ₂	Static	Dyn.	Static	Dyn.	Static	Dyn.		
•KC040XPO	KC40XP	4.000	4.750	4.277	4.473			860		2,130		1,890	.45
KC042XPO	KC42XP	4.250	5.00	4.527	4.723			900		2,240		2,070	.47
•KC045XPO	KC45XP	4.500	5.250	4.777	4.973			920		2,300		2,240	.48
KC047XPO	KC47XP	4.750	5.500	5.027	5.223			950		2,360		2,450	.50
•KC050XPO	KC50XP	5.000	5.750	5.277	5.473			990		2,470		2,610	.58
•KC055XPO	KC55XP	5.500	6.250	5.777	5.973			1,050		2,590		3,070	.59
•KC060XPO	KC60XP	6.000	6.750	6.277	6.473			1,100		2,760		3,520	.63
•KC065XPO	KC65XP	6.500	7.250	6.777	6.973			1,150		2,870		3,950	.68
•KC070XPO	KC70XP	7.000	7.750	7.277	7.473			1,210		3,050		4,450	.73
KC075XPO	KC75XP	7.500	8.250	7.777	7.973			1,260		3,160		4,980	.78
•KC080XPO	KC80XP	8.000	8.750	8.277	8.473	③		1,320	③	3,330	③	5,540	.84
•KC090XPO	KC90XP	9.000	9.750	9.277	9.473			1,440		3,560		6,740	.94
•KC100XPO	KC100XP	10.000	10.750	10.277	10.473			1,490		3,790		7,750	1.06
•KC110XPO	KC110XP	11.000	11.750	11.277	11.473			1,610		4,080		9,150	1.16
•KC120XPO	KC120XP	12.000	12.750	12.277	12.473			1,720		4,310		10,670	1.25
KC140XPO	KC140XP	14.000	14.750	14.277	14.473			1,900		4,770		13,560	1.52
•KC160XPO	KC160XP	16.000	16.750	16.277	16.473			2,070		5,170		16,900	1.73
KC180XPO	KC180XP	18.000	18.750	18.277	18.473			2,240		5,630		20,580	1.94
KC200XPO	KC200XP	20.000	20.750	20.277	20.473			2,410		6,030		24,600	2.16
KC250XPO	KC250XP	25.000	25.750	25.277	25.473			2,760		6,950		34,940	2.69
KC300XPO	KC300XP	30.000	30.750	30.277	30.473			3,100		7,870		47,130	3.21

KD SERIES

SNAPOVER
SEPARATOR
1/4" BALLS



② F = .000

Bearing corners are normally chamfered

Bearing Number		Dimensions in Inches				Capacities ①						Weight in Pounds	
Current	Former	Bore	Outside	Land	Land	Radial in Lbs.		Thrust in Lbs.		Moment (Lbs-In)		Pounds	
			Dia.	Dia. L ₁	Dia. L ₂	Static	Dyn.	Static	Dyn.	Static	Dyn.		
•KD040XPO	KD40XP	4.000	5.000	4.370	4.630			1,330		3,390		2,990	.78
KD042XPO	KD42XP	4.250	5.250	4.620	4.880			1,390		3,450		3,310	.83
•KD045XPO	KD45XP	4.500	5.500	4.870	5.130			1,450		3,630		3,630	.88
KD047XPO	KD47XP	4.750	5.750	5.120	5.380			1,460		3,690		3,810	.94
•KD050XPO	KD50XP	5.000	6.000	5.370	5.630			1,510		3,880		4,170	1.00
•KD055XPO	KD55XP	5.500	6.500	5.870	6.130			1,630		4,120		4,900	1.06
•KD060XPO	KD60XP	6.000	7.000	6.370	6.630			1,700		4,300		5,510	1.16
•KD065XPO	KD65XP	6.500	7.500	6.870	7.130			1,820		4,540		6,360	1.22
•KD070XPO	KD70XP	7.000	8.000	7.370	7.630			1,880		4,780		7,030	1.31
•KD075XPO	KD75XP	7.500	8.500	7.870	8.130			2,000		4,960		7,990	1.41
•KD080XPO	KD80XP	8.000	9.000	8.370	8.630	③		2,060	③	5,150	③	8,740	1.53
•KD090XPO	KD90XP	9.000	10.000	9.370	9.630			2,240		5,590		10,640	1.72
•KD100XPO	KD100XP	10.000	11.000	10.370	10.630			2,360		5,930		12,350	1.88
•KD110XPO	KD110XP	11.000	12.000	11.370	11.630			2,540		6,360		14,650	2.06
•KD120XPO	KD120XP	12.000	13.000	12.370	12.630			2,660		6,720		16,590	2.25
•KD140XPO	KD140XP	14.000	15.000	14.370	14.630			2,970		7,390		21,550	2.73
KD160XPO	KD160XP	16.000	17.000	16.370	16.630			3,210		8,050		26,520	3.10
•KD180XPO	KD180XP	18.000	19.000	18.370	18.630			3,450		8,720		31,970	3.48
KD200XPO	KD200XP	20.000	21.000	20.370	20.630			3,690		9,320		37,900	3.85
•KD250XPO	KD250XP	25.000	26.000	25.370	25.630			4,300		10,750		54,650	4.79
KD300XPO	KD300XP	30.000	31.000	30.370	30.630			4,840		12,110		73,860	5.73

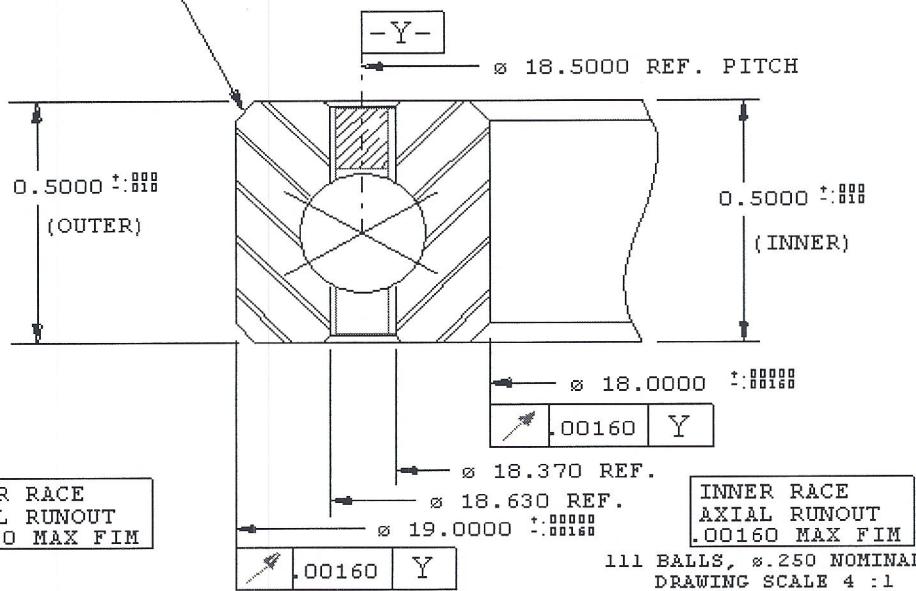
NOTE: * Available from stock -- check for availability of other sizes. X — limited availability.
 ① Capacities listed are not simultaneous. For combined loading see discussion of Bearing Selection and Load Analysis. Dynamic capacities are based upon 500 hours L_{10} life @ 33 1/2 RPM (1.0 million revolutions). Moment capacities are in pound-inches.
 ② "F" is the maximum shaft or housing fillet radius the bearing corners will clear.
 ③ Consult Kaydon for static capacity ratings.

KAYDON CORPORATION

BEARING DATA SHEET

KD180XPO

WILL CLEAR .060
MAX FIL. RAD.
4 EXT. CORNERS

PART NUMBER DETAIL

K= VD 52100 STEEL
D= .500 X .500
1:
8= BORE SIZE x 10 IN INCHES
0:
X= 4-POINT CONTACT
P= STANDARD SNAP-OVER 1 PIECE RING
O= PRECISION CLASS 1
STANDARD .0032 - .0042 CLEARANCE

DYNAMIC "C" RATING (10E6 REVS)

RADIAL = 3,610 LBS
AXIAL = 9,025 LBS
MOMENT = 33,392 IN-LBS

CAPACITIES DO NOT APPLY SIMULTANEOUSLY
AND ARE BASED ON THE "P" SEPARATOR.
FOR THE EFFECT OF PRELOAD OR OTHER
SEPARATORS, CONTACT KAYDON FOR RATINGS.

★ ★ ★ RECOMMENDED FITS ★ ★ ★	
IF ROTATING SHAFT	IF STATIONARY SHAFT
SHAFT DIA	HOUSING BORE
18.0000	19.0000

★ ★ ★ MAXIMUM SPEED IN RPM ★ ★ ★			
LOAD CONDITION	GREASE	OIL	OIL MIST
THRUST ONLY	333	444	N/A
RADIAL OR COMB.	83	111	N/A

FOR BEARINGS LOADED TO THE FOLLOWING PERCENT
OF DYNAMIC RATING, MULTIPLY SPEED X FACTOR SHOWN
FOR THE EFFECT OF PRELOAD OR OTHER
SEPARATORS, CONTACT KAYDON.

20%	33%	50%	67%	100%*	150%*
1.0	0.9	0.8	0.7	0.5	0.2

* NOT RECOMMENDED

AVAILABLE FROM STOCK

FOR MORE INFORMATION CALL KAYDON AT (231) -755-3741
KAYDON RESERVES THE RIGHT TO CHANGE SPECIFICATIONS AND OTHER INFORMATION WITHOUT NOTICE.

030402

FAX 602

FAX 520 621 3398

520 621 5384

MIKE WEINSTEIN
TECHNICAL DRAWING
757-766-4493

SANDY

WHILE YOU WERE OUT

FOR	D. Dean	DATE	Jan 17	TIME	4:30 A.M.
M.	Bill Smith				
OF	SCIENTIFIC SALES - TEMPE			PHONED	
PHONE	<input type="checkbox"/> FAX <input checked="" type="checkbox"/> MOBILE 602 431-1215	AREA CODE	NUMBER	EXTENSION	RETURNED YOUR CALL
MESSAGE	regarding all your request for engineering drawings for Schaevitz.				PLEASE CALL WILL CALL AGAIN CAME TO SEE YOU WANTS TO SEE YOU
SIGNED	Tops FORM 4008				

FROM : SCIENTIFIC SALES--TEMPE

PHONE NO. : 6024311229

Nov. 28 2000 01:37AM P1

LBT-PC-LUDTS

[FAX COVER PAGE]

DATE : 11-27-00

TO : NAME : Chris Lambert
FAX NO. : 520-621-3398

13072

FROM : NAME : Bill Smith
FAX NO. : 602-431-1229

Number of Pages : 3 (including cover page)

Subject / Notes : 602-431-1215

Chris took at food
Please stop will you
This is it will for you
I think job for
A little Bill

Bill

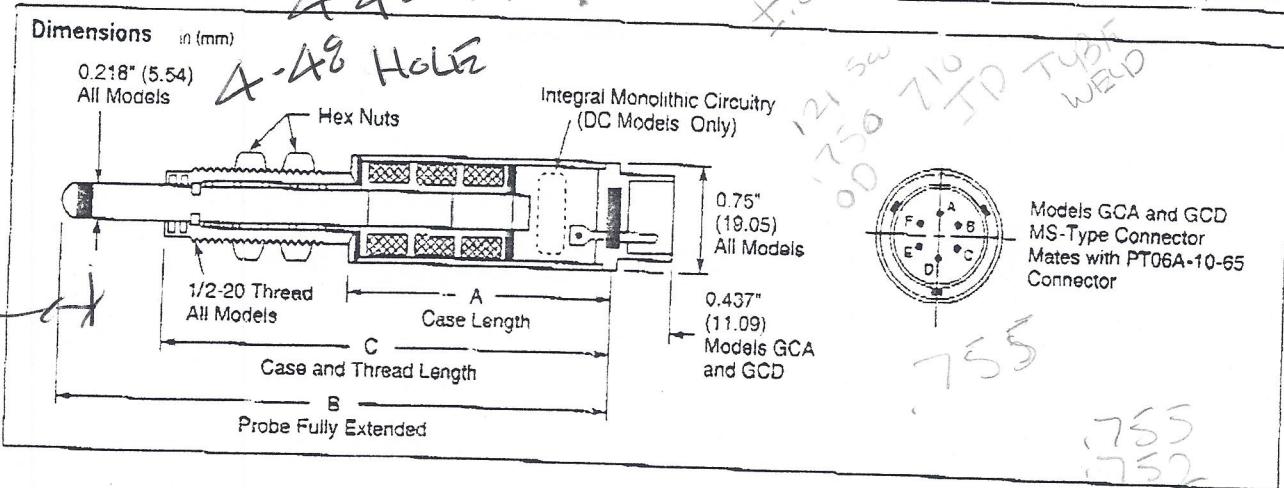
DRAWINGS

MIKE WEINSTEIN 757-766-4493

GCD Series models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/ECC Generic Standards for Residential, Commercial, Light Industrial and Industrial Environments.



GCA/GCD Series
Precision Performance
Ranges: $\pm 0.050"$ to $\pm 2.00"$
AC or DC operated



GCA Specifications @ 2.5 kHz - AC-Operated Models

Operated Models						
Model Number	GCA-121-050	GCA-121-125	GCA-121-250	GCA-121-500	GCA-121-1000	GCA-121-2000
Gaging Range	±0.050" (±1.27mm)	±0.125" (±3.17mm)	±0.250" (±6.35mm)	±0.500" (±12.7mm)	±1.000" (±25.4mm)	±2.00" (±50.8mm)
Phase Shift	+6°	+5°	+5°	+2°	+1°	-1°
Sensitivity (mV/V/0.001")	4.2	2.4	1.6	1.1	0.84	0.34
Impedance (Ohms)						
Primary	430	1710	800	900	900	525
Secondary	950	1820	940	1150	2100	535
Pretravel (Nominal)	0.26" (6.6mm)	0.30" (7.6mm)	0.06" (1.5mm)	0.18" (4.5mm)	0.01" (0.3mm)	0.1"
Minimum Overtravel	0.15" (3.8mm)	0.15" (3.8mm)	0.15" (3.8mm)	0.20" (5.1mm)	0.10" (2.5mm)	0
Spring Load Over Gaging Range	3.5 to 5.8 oz. (99 to 164g)	3.5 to 5.8 oz. (99 to 164g)	3.5 to 5.8 oz. (99 to 164g)	3.2 to 8.0 oz. (91 to 227g)	3.2 to 8.0 oz. (91 to 227g)	3.2 to 8.0 oz. (91 to 227g)
Dimensions						
A (±0.01"/0.25mm)	1.90" (48.3mm)	2.75" (69.9mm)	3.61" (91.7mm)	5.29" (134.4mm)	7.55" (191.8mm)	10.89" (276.6mm)
B (±0.03"/0.76mm)	4.33" (110.0mm)	5.14" (130.6mm)	6.10" (154.9mm)	10.75" (273.1mm)	13.01" (330.5mm)	20.94" (531.9mm)
C (±0.02"/0.50mm)	3.27" (8.1mm)	4.12" (104.6mm)	4.99" (126.7mm)	8.27" (210.1mm)	10.53" (267.5mm)	16.37" (415.8mm)
Weight	2.2 oz (64g)	2.9 oz. (82g)	3.17 oz. (90g)	5.0 oz. (142g)	7.5 oz. (213g)	13 oz. (369g)

GCD Specifications – DC-Operated Models

Model Number	GCD-121-050	GCD-121-125	GCD-121-250	GCD-121-500	GCD-121-1000	GCD-121-2000
Gaging Range	±0.050" (±1.27mm)	±0.125" (±3.17mm)	±0.250" (±6.35mm)	±0.500" (±12.7mm)	±1.000" (±25.4mm)	±2.000" (±50.8mm)
Sensitivity (V/1")	200	80	40	20	10	5
Pretravel (Nominal)	0.30" (7.62mm)	0.35" (8.8mm)	0.18" (4.5mm)	0.20" (5.08mm)	0.01" (.25mm)	0.1"
Minimum Overtravel	0.39" (9.4mm)	0.14" (3.5mm)	0.03" (0.76mm)	1.00" (25.4mm)	0.10" (2.5mm)	0
Spring Load Over Gaging Range	3.5 to 5.8 oz. (99 to 164g)	3.5 to 5.8 oz. (99 to 164g)	3.5 to 5.8 oz. (99 to 164g)	3.2 to 8.0 oz. (91 to 227g)	3.2 to 8.0 oz. (91 to 227g)	3.2 to 8.0 oz. (91 to 227g)
Dimensions	A (±0.01"/0.25mm)	2.66" (67.6mm)	3.50" (88.9mm)	4.37" (111.0mm)	6.06" (153.9mm)	8.31" (211.1mm) 11.48" (291.6mm)
	B (±0.03"/0.76mm)	5.08" (129.0mm)	5.90" (149.9mm)	6.77" (172.0mm)	11.53" (292.9mm)	13.76" (349.5mm) 21.52" (546.6mm)
	C (±0.02"/0.50mm)	4.02" (102.1mm)	4.87" (123.7mm)	5.74" (145.8mm)	9.05" (229.9mm)	11.29" (286.8mm) 16.96" (430.8mm)
Weight		2.5 oz. (71g)	3.2 oz. (93g)	3.5 oz. (100g)	5.5 oz. (156g)	8.0 oz. (227g) 14 oz. (397g)

GCA/GCD Series Precision Gage Heads

Spring-Loaded Design for $\pm 0.050"$ to $\pm 2.00"$ Range Measurement

Features

- CE compliant (DC models)
- All-welded construction
- Resistant to harsh environments
- MS-type connector
- Electronics hermetically sealed
- Calibration certificate supplied with every gage head
- Compatible with all Schaeivitz™ signal conditioners
- Special contact tips (see page 82)

Applications

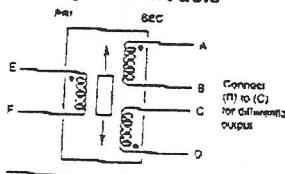
- In-process measurements to close loop with PLC or CNC controller
- Environments requiring hermetically sealed transducers
- High temperatures (300°F for AC units)

Stainless steel construction enables the GCA/GCD Series gage head to perform in environments containing moisture, dirt and other contaminants. Electronic components are hermetically sealed for added protection against hostile conditions. These are heavy duty, long stroke units with ranges up to $\pm 2.0"$ (50mm). Maximum spring force is typically 8 oz (226.8g), dependent upon probe position. The working end or probe has a removable chrome plated, hardened tool steel tip threaded to the probe with a 4-48 UNF-2A threading. Schaeivitz replacement and alternate contact tips are available (see page 82). Tips are also interchangeable with AGD dial indicator tips.

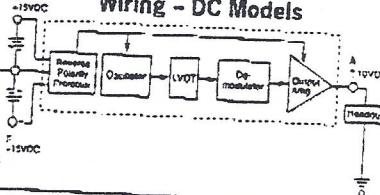
Internal construction prevents the core and shaft from rotating as they move longitudinally. Units terminating into connectors allow for easy cable replacement if damage should occur. Installation and adjustment are facilitated by external threading; locknuts are provided.

GCA/GCD Series gage heads are available in AC and DC versions. AC-operated units utilize external signal conditioning (see the Instrumentation section of this catalog); DC-operated units incorporate the core, LVDT and all necessary electronics in one housing. Use of monolithic, surface mount circuitry eliminates most of the volume, weight and cost of conventional AC excitation, amplification and demodulation equipment.

Wiring - AC Models

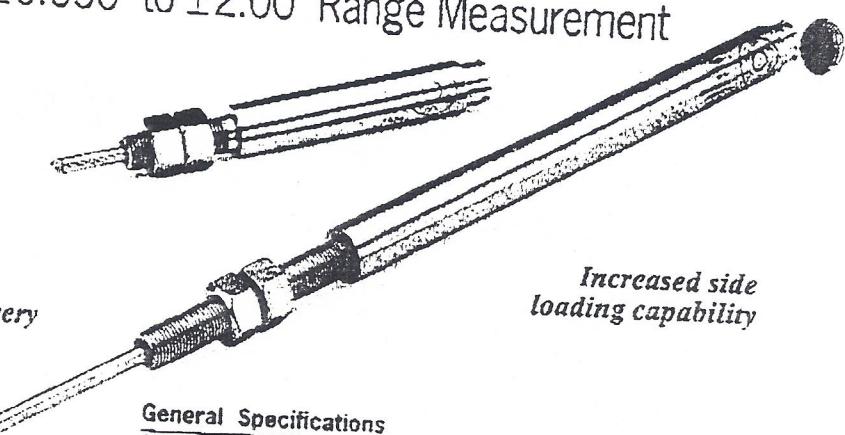


Wiring - DC Models



Internet: www.schaeivitz.com
Fax Back System: 916/431-6541

North America Tel: 800/745-8008
Europe Tel: (01753) 537622



General Specifications

AC-Operated models

Excitation	3 V rms (nom)
Frequency Range	400 Hz to 10 kHz
Null Voltage	Less than 0.5% full scale output
Linearity	$\pm 0.25\%$ of full range output
Repeatability	0.000025" (0.0006 mm)
Operating Temperature	-65°F to 300°F (-55°C to 150°C)
Range	1000 g for 11 milliseconds
Shock Survival	20 g up to 2 kHz
Vibration Tolerance	AISI 400 series stainless steel
Housing Material	6-pin connector

DC-Operated models

Excitation	± 15 VDC ± 30 mA max
Null Voltage	0 VDC
Linearity	$\pm 0.25\%$ of full range output
Repeatability	0.000025" (0.0006 mm)
Operating Temperature	32°F to 160°F (-0°C to 70°C)
Range	250 g for 11 milliseconds half sine
Shock Survival	10 g up to 2 kHz
Vibration Tolerance	AISI 400 series stainless steel
Housing Material	6-pin connector

How to Order

Specify the appropriate model number, followed by the desired Gaging Range suffix. For example: GCA-121-050 is AC operated with a $\pm 0.050"$ range. Special contact tips are also available and can be ordered separately (see page 82).

Model Number	Operation	Gaging Range	Description
GCA-121	AC	050	$\pm 0.050"$ (1.27 mm)
GCD-121	DC	125	$\pm 0.125"$ (3.17 mm)
		250	$\pm 0.250"$ (6.35 mm)
		500	$\pm 0.50"$ (12.7 mm)
		1000	$\pm 1.00"$ (25.4 mm)
		-2000	$\pm 2.00"$ (50.8 mm)

$$\begin{aligned} 1-4 &= 671 \\ 5-9 &= 600 \\ 10-20 &= 551 \\ 100 &= 381 \end{aligned}$$

Precision Compression Springs

Fractional Precision Compression Springs

When meeting exact tolerances is of ultimate importance, use these precision-engineered springs. The outside diameter (OD) is manufactured to critical thousandths, rather than standard fractional sizes, for pinpoint measurements.

Music wire springs are zinc-plated and meet Federal Specification QQW 470. Type 302 stainless steel springs have a passivated finish and

meet Federal Specification QQW 423.

Prices shown are for 1 to 24 springs; for 25 or more individual springs, deduct 30% from the price.



150-PIECE ASSORTMENTS

Assortments have two each of the same springs as listed below. Packed in a compartmented box.

Spring Material	Each
Music Wire	9434K21....\$107.59
Stainless Steel	9435K2.....151.82

Wire Dia.	O'all Lg.	Rate,* Lbs./In.	Music Wire	Stainless Steel	Wire Dia.	O'all Lg.	Rate,* Lbs./In.	Music Wire	Stainless Steel
.120"	.016"	.250"	17.5	9434K12.....	.153	9435K11.....	.81	9434K77.....	.153 9435K79....1.81
.120"	.016"	.500"	8.5	9434K13.....	.153	9435K22.....	.81	9434K79.....	.153 9435K81....1.81
.120"	.016"	.750"	5.0	9434K14.....	.145	9435K13.....	.81	9434K8.....	.153 9435K82....1.81
.120"	.018"	.750"	8.5	9434K17.....	.145	9435K16.....	.81	9434K116.....	.155 9435K118....1.81
.120"	.022"	.500"	31.0	9434K19.....	.145	9435K18.....	.81	9434K82.....	.153 9435K84....1.81
.120"	.022"	.8125"	18.0	9434K2.....	.145	9435K19.....	.81	9434K83.....	.153 9435K85....1.81
.180"	.016"	.750"	2.5	9434K23.....	.145	9435K22.....	.81	9434K84.....	.153 9435K86....1.81
.180"	.018"	.500"	7.0	9434K25.....	.153	9435K24.....	.81	9434K89.....	.153 9435K91....1.81
.180"	.026"	.5625"	23.0	9434K31.....	.145	9435K3.....	.81	9434K91.....	.153 9435K93....1.81
.180"	.026"	.875"	15.0	9434K32.....	.145	9435K31.....	.81	9434K95.....	.153 9435K97....1.81
.180"	.032"	1.000"	29.0	9434K35.....	.153	9435K34.....	.81	9434K97.....	.153 9435K99....1.81
.180"	.032"	.1750"	16.5	9434K111.....	.173	9435K128.....	.81	9434K98.....	.153 9435K111....1.81
.240"	.022"	.375"	12.0	9434K36.....	.153	9435K35.....	.81	9434K112.....	.163 9435K114....1.81
.240"	.022"	.5625"	8.0	9434K37.....	.153	9435K36.....	.81	9434K113.....	.163 9435K115....1.81
.240"	.022"	.8125"	5.0	9434K38.....	.153	9435K37.....	.81	9434K114.....	.163 9435K116....1.81
.240"	.026"	.625"	12.5	9434K4.....	.153	9435K39.....	.81	9434K115.....	.163 9435K117....1.81
.240"	.026"	.875"	8.0	9434K41.....	.153	9435K4.....	.81	9434K117.....	.163 9435K119....1.81
.240"	.032"	.625"	28.0	9434K43.....	.153	9435K42.....	.81	9434K118.....	.163 9435K152....1.81
.240"	.032"	1.000"	16.0	9434K44.....	.137	9435K43.....	.81	9434K119.....	.163 9435K122....1.81
.240"	.038"	.750"	46.0	9434K46.....	.153	9435K45.....	.81	9434K121.....	.163 9435K123....1.81
.240"	.038"	1.500"	21.0	9434K47.....	.153	9435K46.....	.81	9434K123.....	.163 9435K125....1.81
.240"	.042"	.8125"	60.0	9434K49.....	.153	9435K48.....	.81	9434K124.....	.163 9435K126....1.81
.240"	.042"	1.500"	31.0	9434K161.....	.145	9435K163.....	.81	9434K127.....	.160 9435K129....2.28
.300"	.022"	.500"	6.5	9434K51.....	.153	9435K5.....	.81	9434K129.....	.160 9435K154....2.28
.300"	.022"	.6875"	4.5	9434K52.....	.153	9435K51.....	.81	9434K130.....	.180 9435K135....2.28
.300"	.022"	.875%"	3.0	9434K53.....	.153	9435K52.....	.81	9434K134.....	.180 9435K136....2.28
.300"	.026"	1.000%"	16.0	9434K44.....	.153	9435K45.....	.81	9434K135.....	.180 9435K137....2.28
.300"	.038%"	.750%"	46.0	9434K47.....	.153	9435K46.....	.81	9434K136.....	.180 9435K138....2.28
.300"	.042%"	1.500%"	21.0	9434K49.....	.153	9435K48.....	.81	9434K137.....	.180 9435K139....2.28
.300"	.042%"	.8125%"	60.0	9434K50.....	.153	9435K51.....	.81	9434K138.....	.180 9435K154....2.28
.300"	.042%"	1.500%"	31.0	9434K161.....	.145	9435K163.....	.81	9434K139.....	.180 9435K132....2.28
.300"	.045%"	.8125%"	16.0	9434K51.....	.153	9435K52.....	.81	9434K140.....	.180 9435K143....2.28
.300"	.045%"	1.000%"	5.0	9434K56.....	.153	9435K56.....	.81	9434K141.....	.180 9435K143....2.28
.300"	.045%"	.6875%"	16.0	9434K58.....	.153	9435K58.....	.81	9434K142.....	.180 9435K144....2.28
.300"	.045%"	1.000%"	5.0	9434K59.....	.153	9435K61.....	.81	9434K143.....	.180 9435K139....2.28
.300"	.045%"	.6875%"	16.0	9434K59.....	.153	9435K64.....	.81	9434K144.....	.180 9435K139....2.28
.300"	.045%"	1.000%"	10.0	9434K65.....	.153	9435K67.....	.81	9434K145.....	.180 9435K144....2.28
.300"	.045%"	.6875%"	13.5	9434K62.....	.153	9435K64.....	.81	9434K146.....	.180 9435K141....2.28
.300"	.042%"	.1500%"	20.0	9434K65.....	.153	9435K67.....	.81	9434K147.....	.180 9435K148....2.28
.300"	.045%"	.1500%"	26.0	9434K162.....	.103	9435K64.....	.81	9434K148.....	.180 9435K143....2.28
.360"	.026%"	.750%"	6.0	9434K7.....	.153	9435K72.....	.81	9434K149.....	.180 9435K144....2.28
.360"	.026%"	1.125%"	3.5	9434K71.....	.153	9435K73.....	.81	9434K150.....	.180 9435K147....2.28
.360"	.032%"	.500%"	18.0	9434K72.....	.153	9435K74.....	.81	9434K151.....	.180 9435K148....2.28
.360"	.032%"	.875%"	10.0	9434K73.....	.153	9435K75.....	.81	9434K152.....	.180 9435K149....2.28
.360"	.032%"	.1500%"	5.5	9434K74.....	.153	9435K76.....	.81	9434K153.....	.180 9435K151....2.28
.360"	.038%"	.8125%"	19.0	9434K76.....	.153	9435K78.....	.81	9434K154.....	.180 9435K151....2.28

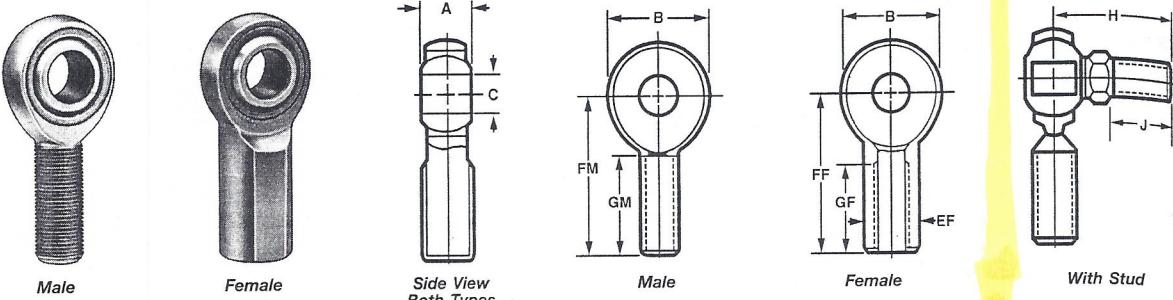
* Rate for music wire. Multiply by % (.833) for stainless steel rate.

Metric Precision Compression Springs

Designed with closed flat ends, these springs are for high-stress applications. Music wire meets DIN 17223, Class C, #11200 tolerances. Stainless steel meets DIN 17224, #14310. Dimensions and force tolerances for all parts meet or exceed DIN 2095 (Grade 2).

Rod Size, mm	Hole Dia., mm	O'all Lg., mm	Rate, N/mm	Music Wire	Stainless Steel	Rod Size, mm	Hole Dia., mm	O'all Lg., mm	Rate, N/mm	Music Wire	Stainless Steel		
3.9	6.1	18.50	1.55	94125K39.....	S.1.86	94125K389.....	6.5	9.6	40.50...	1.59	94125K636.....	\$1.86	
4.0	6.2	9.40	1.46	94125K422.....	1.86	94125K472.....	2.37	9.5	59.00...	1.08	94125K639.....	1.86	
4.0	6.2	14.00	0.93	94125K424.....	1.86	94125K474.....	2.37	7.5	12.5...	18.00	46.58	94125K711.....	1.86
4.0	6.2	20.50	0.61	94125K426.....	1.86	94125K476.....	2.37	7.5	12.5...	26.50	29.71	94125K712.....	1.86
4.0	6.2	30.00	0.41	94125K428.....	1.86	94125K478.....	2.37	7.5	12.5...	38.50	19.22	94125K716.....	1.86
4.0	6.2	44.50	0.27	94125K432.....	1.86	94125K482.....	2.37	7.5	12.5...	55.00	13.04	94125K718.....	1.86
4.1	6.0	24.00	0.25	94125K412.....	1.86	94125K452.....	2.37	7.5	12.5...	79.50	8.81	94125K719.....	1.86
4.1	6.0	10.50	0.60	94125K414.....	1.86	94125K464.....	2.37	7.8	14.6...	20.50	127.49	94125K728.....	1.86
4.1	6.0	16.00	0.38	94125K416.....	1.86	94125K466.....	2.37	7.8	14.6...	29.00	62.86	94125K734.....	1.86
4.1	6.0	35.00	0.17	94125K417.....	1.86	94125K467.....	2.37	7.8	14.6...	45.90	46.88	94125K736.....	1.86
4.1	6.0	53.00	0.11	94125K418.....	1.86	94125K468.....	2.37	7.8	14.6...	71.40	28.73	94125K739.....	1.86
5.0	7.6	11.50	1.83	94125K521.....	1.86	94125K561.....	2.37	8.2	11.9...	20.00	7.09	94125K811.....	2.23
5.0	7.6	17.00	1.17	94125K523.....	1.86	94125K563.....	2.37	8.2	11.9...	29.50	4.51	94125K813.....	2.23
5.0	7.6	25.50	0.76	94125K525.....	1.86	94125K565.....	2.37	8.2	11.9...	44.50	2.92	94125K815.....	2.23
5.0	7.6	36.50	0.51	94125K529.....	1.86	94125K569.....	2.37	8.2	11.9...	64.00	1.99	94125K817.....	2.23
5.0	7.6	54.00	0.34	94125K531.....	1.86	94125K571.....	2.37	8.2	11.9...	93.50	1.34	94125K819.....	2.23
5.0	7.7	10.50	4.77	94125K534.....	1.86	94125K574.....	2.37	8.4	11.8...	17.50	2.90	94125K822.....	2.40
5.0	7.7	15.50	3.03	94125K537.....	1.86	94125K577.....	2.37	8.4	11.8...	26.00	1.85	94125K837.....	2.40
5.0	7.7	23.00	1.96	94125K541.....	1.86	94125K581.....	2.37	8.4	11.8...	39.00	1.20	94125K839.....	2.40
5.0	7.7	33.00	1.33	94125K542.....	1.86	94125K582.....	2.37	8.4	11.8...	56.00	0.81	94125K844.....	2.40
5.0	7.7	48.00	0.90	94125K547.....	1.86	94125K587.....	2.37	8.4	11.8...	81.50	0.55	94125K848.....	2.40
6.0	11.6	23.00	63.55	94125K624.....	1.86	94125K664.....	2.37	10.0	15.6...	20.00	32.46	94125K136.....	2.40
6.0	11.6	36.50	36.87	94125K626.....	1.86	94125K666.....	2.37	10.0	15.6...	30.20	26.69	94125K138.....	2.40
6.0	11.6	56.80	22.56	94125K628.....	1.86	94125K668.....	2.37	10.0	15.6...	48.90	11.96	94125K141.....	2.40
6.1	9.6	15.00	14.32	94125K612.....	1.86	94125K652.....	2.37	10.3	14.7...	24.00	9.76	94125K112.....	2.40
6.1	9.6	22.00	8.92	94125K614.....	1.86	94125K654.....	2.37	10.3	14.7...	36.00	6.23	94125K114.....	2.40
6.1	9.6	33.00	5.83	94125K616.....	1.86	94125K656.....	2.37	10.3	14.7...	53.50	4.04	94125K116.....	2.40
6.1	9.6	47.50	3.96	94125K618.....	1.86	94125K658.....	2.37	10.3	14.7...	78.00	2.73	94125K118.....	2.40
6.1	9.6	69.00	2.69	94125K619.....	1.86	94125K659.....	2.37	10.6	14.6...	27.00	3.63	94125K121.....	2.40
6.5	9.6	13.00	5.68	94125K631.....	1.86	94125K671.....	2.37	10.6	14.6...	41.50	2.31	94125K123.....	2.40
6.5	9.6	19.00											

Ball Joint Rod Ends



ROD END DIMENSIONS

Thread Size	A	B	C	Male Dimensions		Female Dimensions			H	J
				FM	GM	EF	FF	60645K 59915K	6072K 60745K	
10-32	5/16"	5/8"	3/16"	1 1/4"	3/4"	13/32"	1 1/16"	1/2"	9/16"	11/16"
1/4"-28	3/8"	3/4"	1/4"	19/16"	1"	15/32"	1 1/16"	5/8"	3/4"	11/32"
5/16"-24	7/16"	7/8"	5/16"	17/16"	1 1/4"	1/2"	1 3/8"	5/8"	3/4"	17/32"
3/8"-24	1/2"	1"	3/8"	1 15/16"	1 1/4"	11/16"	1 5/8"	3/4"	15/16"	29/32"
7/16"-20	9/16"	1 1/8"	7/16"	2 1/8"	1 3/8"	3/4"	1 19/16"	7/8"	1 1/16"	1 1/4"
1/2"-20	5/8"	1 1/16"	1/2"	2 7/16"	1 1/2"	7/8"	2 1/8"	1"	13/16"	2"
5/8"-18	9/4"	1 1/2"	5/8"	2 5/8"	1 5/8"	1"	2 1/2"	1 1/4"	1 1/2"	2 1/2"
3/4"-16	7/8"	1 3/4"	3/4"	2 7/8"	1 1/4"	1 1/8"	2 7/8"	1 3/8"	1 3/4"	3"
1 1/4"-12	1 3/8"	2 3/4"	1"	4 1/8"	2 1/8"	1 5/8"	4 1/8"	2 1/8"	2 1/8"	11/16"

Ball joint design handles up to 50° of misalignment, giving versatility to control linkages and shaft connections. Available with either right- or left-hand shank threads, they're excellent for linkages, clutches, throttles, and shift control rods. Rods fit into the internal bore of ball. A metal housing supports the ball and has a threaded mounting

shank. Optional attached steel studs allow right angle connections. Available with male and with female threaded shanks. Rod ends with studs are not rated for load capacity because their load capacity varies greatly depending on the application.

To Order: Please specify right- or left-hand shank threads.

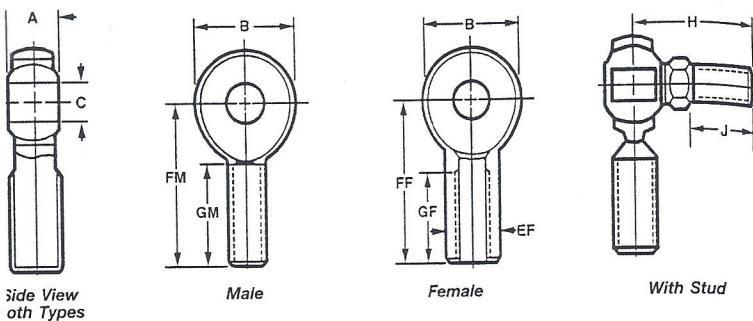
Thread Size	ROD ENDS WITHOUT STUD			ROD ENDS WITH STUD		
	Male Threads		Female Threads	Male Threads		Female Threads
	Static Radial Load Cap., lbs.	Each	Static Radial Load Cap., lbs.	Each	Each	Each
Zinc-Plated Steel Housing, Chrome-Plated Case-Hardenend Steel Ball						
10-32	1,204	60645K11	\$3.68	2,079	60645K31	\$2.69
1/4"-28	2,212	60645K12	2.98	3,208	60645K32	2.71
5/16"-24	3,577	60645K13	3.15	3,824	60645K33	2.81
3/8"-24	5,068	60645K14	3.68	5,087	60645K34	3.43
7/16"-20	6,345	60645K15	4.91	6,385	60645K35	4.70
1/2"-20	8,338	60645K16	6.21	9,096	60645K36	6.56
5/8"-18	9,713	60645K17	9.44	9,713	60645K37	9.27
3/4"-16	14,207	60645K18	12.47	14,207	60645K38	12.53
Plated Carbon Steel Housing, Oil-Impregnated Bronze Race, Plated Carbon Steel Ball						
10-32	900	6072K61	\$3.98	1,850	6072K51	\$3.98
1/4"-28	1,700	6072K62	4.02	2,700	6072K52	3.98
5/16"-24	2,500	6072K63	4.07	3,350	6072K53	4.02
3/8"-24	4,000	6072K64	4.36	4,450	6072K54	4.02
7/16"-20	5,000	6072K65	5.13	5,350	6072K55	5.13
1/2"-20	7,000	6072K66	7.13	7,400	6072K56	6.62
5/8"-18	8,050	6072K67	9.62	8,050	6072K57	9.40
3/4"-16	11,300	6072K68	12.42	11,350	6072K58	12.18
Type 303 Stainless Steel Teflon-Lined Housing, Type 440C Stainless Steel Ball						
10-32	1,204	59915K11	\$8.21	2,079	59915K31	\$8.21
1/4"-28	2,212	59915K12	9.33	3,208	59915K32	9.33
5/16"-24	3,577	59915K13	10.81	3,824	59915K33	10.81
3/8"-24	5,068	59915K14	14.81	5,087	59915K34	14.81
7/16"-20	6,345	59915K15	19.60	6,385	59915K35	19.60
1/2"-20	8,338	59915K16	25.79	9,096	59915K36	25.79
5/8"-18	9,713	59915K17	35.79	9,713	59915K37	35.79
3/4"-16	14,207	59915K18	48.12	14,207	59915K38	48.12
Chrome-Alloy Steel Housing, Teflon-Lined Alloy Steel Race, 52100 Bearing Steel Ball						
10-32	2,851	60745K21	\$11.93	3,733	60745K41	\$11.93
1/4"-28	5,260	60745K22	12.00	6,190	60745K42	12.00
5/16"-24	7,639	60745K23	12.17	7,639	60745K43	12.17
3/8"-24	9,544	60745K24	13.31	9,544	60745K44	13.31
7/16"-20	10,285	60745K25	15.94	10,285	60745K45	15.94
1/2"-20	16,238	60745K26	18.96	15,336	60745K46	18.96
5/8"-18	17,955	60745K27	25.94	17,955	60745K47	25.94
3/4"-16	28,081	60745K28	34.57	28,081	60745K48	34.57
1 1/4"-12	76,200	60745K31	93.61	76,200	60745K51	93.61
Anodized Aluminum Housing, Teflon-Lined Alloy Steel Race, 52100 Bearing Steel Ball						
3/8"-24	4,208	60685K11	\$11.35		60685K21	\$12.38
7/16"-20	4,534	60685K12	12.85		60685K22	14.08
1/2"-20	7,698	60685K13	15.13		60685K23	16.58
5/8"-18	8,516	60685K14	18.19		60685K24	20.75
3/4"-16	13,319	60685K15	20.42		60685K25	25.35

3/8"-24	4,208	60685K11	\$11.35	
7/16"-20	4,534	60685K12	12.85	
1/2"-20	7,698	60685K13	15.13	
5/8"-18	8,516	60685K14	18.19	
3/4"-16	13,319	60685K15	20.42	

STEVE 1/24/01
9:18 A.M.

WE NEED
3 EACH FOR
THE LUDT on
LBT P.C.
DHP

Ends



ROD END DIMENSIONS

Male Dimensions	Female Dimensions			H	J	Stud		
	FM	GM	EF	FF	60645K 59915K	6072K 60745K		
...1/4"		3/4"		13/32", 1 1/16"	1/2"	9/16"	11 1/4"	1/2"
...19/16"		1"		15/32", 1 5/16"	5/8"	3/4"	11 1/2"	5/16"
...17/8"		1 1/4"		1/2", 1 9/16"	5/8"	3/4"	17/32"	11 1/16"
...11 5/16"		1 1/4"		11/16", 1 5/8"	3/4"	15/16"	19/16"	29/32"
...21/8"		1 3/8"		3/4", 1 13/16"	7/8"	1 1/16"	1 3/4"	1 1/16"
...27/16"		1 1/2"		7/8", 2 1/8"	1"	1 3/16"	2"	1 1/8"
...25/16"		1 5/8"		1"	2 1/2"	1 1/2"	2 1/2"	1 1/2"
...27/8"		1 3/4"		1 1/8", 2 7/8"	1 3/8"	1 3/8"	3"	1 13/16"
...4 1/8"		2 1/8"		1 5/8", 4 1/8"		2 1/8"		

ent, giving versatility
to control linkage arm with either right-
hand or left-hand shank threads. They're
available with male and with female threaded
mounting.

shank. Optional attached steel studs allow right angle connections.
Available with male and with female threaded shanks. Rod ends with
studs are not rated for load capacity because their load capacity varies
greatly depending on the application.

To Order Please specify right- or left-hand shank threads.

S WITHOUT STUD

Static Radial Load Cap., lbs.	Female Threads		Male Threads Each	Female Threads Each
	Each	Each		

e-Hardened Steel Ball

1/4"-20	2,212	60645K11	2,079	60645K31	\$2.69	60645K21	\$4.69	60645K41	\$3.71
5/16"-24	3,577	60645K13	3,15	60645K33	2,81	60645K22	4.12	60645K42	3.80
3/8"-24	5,068	60645K14	3,68	60645K34	3.43	60645K23	4.27	60645K43	3.96
7/16"-20	6,345	60645K15	4.91	60645K35	4.70	60645K25	6.33	60645K44	4.63
1/2"-20	8,338	60645K16	6.21	60645K36	6.56	60645K26	7.86	60645K45	6.14
5/8"-18	9,713	60645K17	9.44	60645K37	9.27	60645K27	12.43	60645K46	8.22
3/4"-16	14,207	60645K18	12.47	60645K38	12.53	60645K28	18.16	60645K47	12.25
								60645K48	18.22

Plated Carbon Steel Housing, Oil-Impregnated Bronze Race, Plated Carbon Steel Ball

10-32	900	6072K61	\$3.98	1,850	6072K51	\$3.98	6072K81	\$4.96	6072K71	\$4.96
1/4"-28	1,700	6072K62	4.02	2,700	6072K52	3.98	6072K82	5.07	6072K72	5.04
5/16"-24	2,500	6072K63	4.07	3,350	6072K53	4.02	6072K83	5.16	6072K73	5.09
3/8"-24	4,000	6072K64	4.36	4,450	6072K54	4.02	6072K84	5.49	6072K74	5.16
7/16"-20	5,000	6072K65	5.13	5,350	6072K55	5.13	6072K85	6.49	6072K75	6.47
1/2"-20	7,000	6072K66	7.13	7,400	6072K56	6.62	6072K86	8.69	6072K76	8.20
5/8"-18	8,050	6072K67	9.62	8,050	6072K57	9.40	6072K87	12.47	6072K77	12.24
3/4"-16	11,300	6072K68	12.42	11,350	6072K58	12.18	6072K88	17.82	6072K78	17.60

Type 303 Stainless Steel Teflon-Lined Housing, Type 440C Stainless Steel Ball

10-32	1,204	59915K11	\$8.21	2,079	59915K31	\$8.21	59915K31		59915K31	
1/4"-28	2,212	59915K12	9.33	3,208	59915K32	9.33	59915K32		59915K32	
5/16"-24	3,577	59915K13	10.81	3,824	59915K33	10.81	59915K33		59915K33	
3/8"-24	5,068	59915K14	14.81	5,087	59915K34	14.81	59915K34		59915K34	
7/16"-20	6,345	59915K15	19.60	6,385	59915K35	19.60	59915K35		59915K35	
1/2"-20	8,338	59915K16	25.79	9,096	59915K36	25.79	59915K36		59915K36	
5/8"-18	9,713	59915K17	35.79	9,713	59915K37	35.79	59915K37		59915K37	
3/4"-16	14,207	59915K18	48.12	14,207	59915K38	48.12	59915K38		59915K38	

Chrome-Alloy Steel Housing, Teflon-Lined Alloy Steel Race, 52100 Bearing Steel Ball

10-32	2,851	60745K21	\$11.93	3,733	60745K41	\$11.93	60745K61	\$12.91	60745K81	\$12.91
1/4"-28	5,260	60745K22	12.00	6,190	60745K42	12.00	60745K62	12.96	60745K82	12.96
5/16"-24	7,639	60745K23	12.17	7,639	60745K43	12.17	60745K63	13.26	60745K83	13.26
3/8"-24	9,544	60745K24	13.31	9,544	60745K44	13.31	60745K64	14.44	60745K84	14.44
7/16"-20	10,285	60745K25	15.94	10,285	60745K45	15.94	60745K65	17.31	60745K85	17.31
1/2"-20	16,238	60745K26	18.96	15,336	60745K46	18.96	60745K66	20.57	60745K86	20.57
5/8"-18	17,955	60745K27	25.94	17,955	60745K47	25.94	60745K67	27.44	60745K87	27.44
3/4"-16	28,081	60745K28	34.57	28,081	60745K48	34.57	60745K68	38.93	60745K88	38.93
1 1/4"-12	76,200	60745K31	93.61	76,200	60745K51	93.61				

Anodized Aluminum Housing, Teflon-Lined Alloy Steel Race, 52100 Bearing Steel Ball

3/8"-24	4,208	60685K11	\$11.35				60685K21	\$12.38		
7/16"-20	4,534	60685K12	12.85				60685K22	14.08		
1/2"-20	7,698	60685K13	15.13				60685K23	16.58		
5/8"-18	8,516	60685K14	18.19				60685K24	20.75		
3/4"-16	13,319	60685K15	20.42				60685K25	25.35		

*Steward Observatory
Technical Division
University of Arizona*

*Tucson, AZ 85721
Main Office: (520) 621-7659
Fax: (520) 621-3398*

FAX

To: BILL SMITH
Fax: (602) 431-1229

From: DAVID DEAN
Phone: (520) 621-3398

Date: 11/16/00

Remarks: Hi Bill,

CAN I GET A ENGINEERING DRAWING
ON A LUCAS GCD-121-500 PREFERANCE
CHRIS LAMBERT FAX ON 11-27-00.

I NEED MORE INFO THAN WHAT WAS
PROVIDED ON THAT FAX.

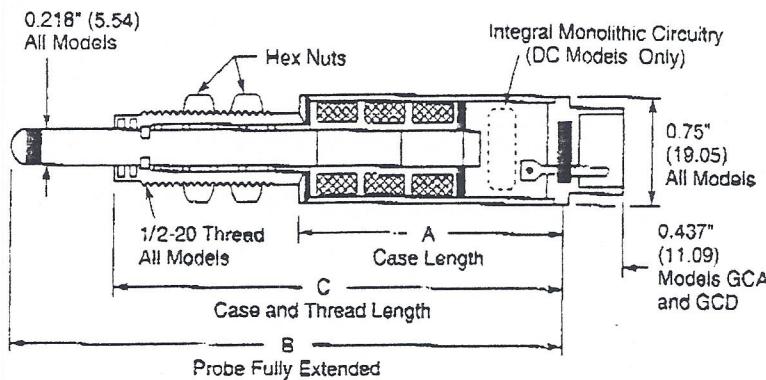
THANK DAVID DEAN

GCD Series models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/ECC Generic Standards for Residential, Commercial, Light Industrial and Industrial Environments.



GCA/GCD Series
Precision Performance
Ranges: $\pm 0.050"$ to $\pm 2.00"$
AC or DC operated

Dimensions in (mm)



Models GCA and GCD
MS-Type Connector
Mates with PT06A-10-65
Connector

GCA Specifications @ 2.5 kHz - AC-Operated Models

Model Number	GCA-121-050	GCA-121-125	GCA-121-250	GCA-121-500	GCA-121-1000	GCA-121-2000
Gaging Range	$\pm 0.050"$ ($\pm 1.27\text{mm}$)	$\pm 0.125"$ ($\pm 3.17\text{mm}$)	$\pm 0.250"$ ($\pm 6.35\text{mm}$)	$\pm 0.500"$ ($\pm 12.7\text{mm}$)	$\pm 1.000"$ ($\pm 25.4\text{mm}$)	$\pm 2.00"$ ($\pm 50.8\text{mm}$)
Phase Shift	+6°	+5°	+5°	+2°	+1°	-1°
Sensitivity (mV/V/0.001")	4.2	2.4	1.6	1.1	0.84	0.34
Impedance (Ohms)						
Primary	430	1710	800	900	900	525
Secondary	950	1820	940	1150	2100	535
Pretravel (Nominal)	0.26" (6.6mm)	0.30" (7.6mm)	0.06" (1.5mm)	0.18" (4.5mm)	0.01" (0.3mm)	0.1"
Minimum Overtravel	0.15" (3.8mm)	0.15" (3.8mm)	0.15" (3.8mm)	0.20" (5.1mm)	0.10" (2.5mm)	0
Spring Load Over	3.5 to 5.8 oz. (99 to 164g)	3.5 to 5.8 oz. (99 to 164g)	3.5 to 5.8 oz. (99 to 164g)	3.2 to 8.0 oz. (91 to 227g)	3.2 to 8.0 oz. (91 to 227g)	3.2 to 8.0 oz. (91 to 227g)
Dimensions						
A ($\pm 0.01"/0.25\text{mm}$)	1.90" (48.3mm)	2.75" (69.9mm)	3.61" (91.7mm)	5.29" (134.4mm)	7.55" (191.8mm)	10.89" (276.6mm)
B ($\pm 0.03"/0.76\text{mm}$)	4.33" (110.0mm)	5.14" (130.6mm)	6.10" (154.9mm)	10.75" (273.1mm)	13.01" (350.5mm)	20.94" (531.9mm)
C ($\pm 0.02"/0.50\text{mm}$)	3.27" (8.1mm)	4.12" (104.6mm)	4.99" (126.7mm)	8.27" (210.1mm)	10.53" (267.5mm)	16.37" (415.8mm)
Weight	2.2 oz (64g)	2.9 oz. (82g)	3.17 oz. (90g)	5.0 oz. (142g)	7.5 oz. (213g)	13 oz. (369g)

GCD Specifications - DC-Operated Models

Model Number	GCD-121-050	GCD-121-125	GCD-121-250	GCD-121-500	GCD-121-1000	GCD-121-2000
Gaging Range	$\pm 0.050"$ ($\pm 1.27\text{mm}$)	$\pm 0.125"$ ($\pm 3.17\text{mm}$)	$\pm 0.250"$ ($\pm 6.35\text{mm}$)	$\pm 0.500"$ ($\pm 12.7\text{mm}$)	$\pm 1.000"$ ($\pm 25.4\text{mm}$)	$\pm 2.00"$ ($\pm 50.8\text{mm}$)
Sensitivity (V/1")	200	80	40	20	10	5
Pretravel (Nominal)	0.30" (7.62mm)	0.55" (8.8mm)	0.18" (4.5mm)	0.20" (5.08mm)	0.01" (.25mm)	0.1"
Minimum Overtravel	0.39" (9.4mm)	0.14" (3.5mm)	0.03" (0.76mm)	1.00" (25.4mm)	0.10" (2.5mm)	0
Spring Load Over	3.5 to 5.8 oz. (99 to 164g)	3.5 to 5.8 oz. (99 to 164g)	3.5 to 5.8 oz. (99 to 164g)	3.2 to 8.0 oz. (91 to 227g)	3.2 to 8.0 oz. (91 to 227g)	3.2 to 8.0 oz. (91 to 227g)
Dimensions						
A ($\pm 0.01"/0.25\text{mm}$)	2.66" (67.6mm)	3.50" (88.9mm)	4.37" (111.0mm)	6.06" (153.9mm)	8.31" (211.1mm)	11.48" (291.6mm)
B ($\pm 0.03"/0.76\text{mm}$)	5.08" (129.0mm)	5.90" (149.9mm)	6.77" (172.0mm)	11.53" (292.9mm)	13.76" (349.5mm)	21.52" (546.6mm)
C ($\pm 0.02"/0.50\text{mm}$)	4.02" (102.1mm)	4.87" (123.7mm)	5.74" (145.8mm)	9.05" (229.9mm)	11.29" (286.8mm)	16.96" (430.8mm)
Weight	2.5 oz. (71g)	3.2 oz. (93g)	3.5 oz. (100g)	5.5 oz. (156g)	8.0 oz. (227g)	14 oz. (397g)

GCA/GCD Series Precision Gage Heads

Spring-Loaded Design for $\pm 0.050"$ to $\pm 2.00"$ Range Measurement

Features

- CE compliant (DC models)
- All-welded construction
- Resistant to harsh environments
- MS-type connector
- Electronics hermetically sealed
- Calibration certificate supplied with every gage head
- Compatible with all Schaeitz™ signal conditioners
- Special contact tips (see page 82)

Applications

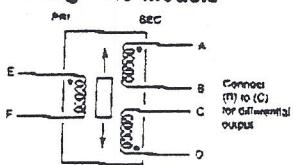
- In-process measurements to close loop with PLC or CNC controller
- Environments requiring hermetically sealed transducers
- High temperatures (300°F for AC units)

Stainless steel construction enables the GCA/GCD Series gage head to perform in environments containing moisture, dirt and other contaminants. Electronic components are hermetically sealed for added protection against hostile conditions. These are heavy duty, long stroke units with ranges up to $\pm 2.0"$ (50mm). Maximum spring force is typically 8 oz (226.8g), dependent upon probe position. The working end or probe has a removable chrome plated, hardened tool steel tip threaded to the probe with a 4-48 UNF-2A threading. Schaeitz replacement and alternate contact tips are available (see page 82). Tips are also interchangeable with AGD dial indicator tips.

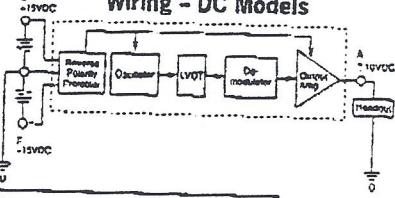
Internal construction prevents the core and shaft from rotating as they move longitudinally. Units terminating into connectors allow for easy cable replacement if damage should occur. Installation and adjustment are facilitated by external threading; locknuts are provided.

GCA/GCD Series gage heads are available in AC and DC versions. AC-operated units utilize external signal conditioning (see the Instrumentation section of this catalog); DC-operated units incorporate the core, LVDT and all necessary electronics in one housing. Use of monolithic, surface mount circuitry eliminates most of the volume, weight and cost of conventional AC excitation, amplification and demodulation equipment.

Wiring - AC Models

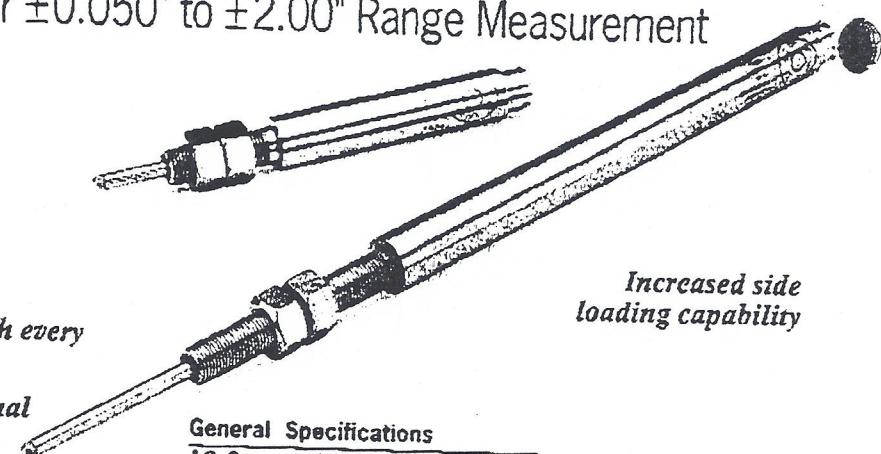


Wiring - DC Models



Internet: www.schaeitz.com
Fax Back System: 916/431-6541

North America Tel: 800/745-8008
Europe Tel: (01753) 537622



Increased side loading capability

General Specifications

AC-Operated models

Excitation	3 V rms (nom)
Frequency Range	400 Hz to 10 kHz
Null Voltage	Less than 0.5% full scale output
Linearity	$\pm 0.25\%$ of full range output
Repeatability	0.000025" (0.0006 mm)
Operating Temperature Range	-65°F to 300°F (-55°C to 150°C)
Shock Survival	1000 g for 11 milliseconds
Vibration Tolerance	20 g up to 2 kHz
Housing Material	AISI 400 series stainless steel
Electrical Termination	6-pin connector

DC-Operated models

Excitation	± 15 VDC ± 30 mA max
Null Voltage	0 VDC
Linearity	$\pm 0.25\%$ of full range output
Repeatability	0.000025" (0.0006 mm)
Operating Temperature Range	32°F to 160°F (-0°C to 70°C)
Shock Survival	250 g for 11 milliseconds half sine
Vibration Tolerance	10 g up to 2 kHz
Housing Material	AISI 400 series stainless steel
Electrical Termination	6-pin connector

How to Order

Specify the appropriate model number, followed by the desired Gaging Range suffix. For example: GCA-121-050 is AC operated with a $\pm 0.050"$ range. Special contact tips are also available and can be ordered separately (see page 82).

Model Number	Operation	Gaging Range	Description
GCA-121	AC	050	$\pm 0.050"$ (1.27 mm)
GCD-121	DC	125	$\pm 0.125"$ (3.17 mm)
		250	$\pm 0.250"$ (6.35 mm)
		500	$\pm 0.50"$ (12.7 mm)
		1000	$\pm 1.00"$ (25.4 mm)
		2000	$\pm 2.00"$ (50.8 mm)

$$\begin{aligned}
 1 - 4 &= 671 \\
 5 - 9 &= 600 \\
 5 - 9 &= 551 \\
 10 - 20 &= 381 \\
 100 &=
 \end{aligned}$$

ULTRA MOTION

High Precision At An
Affordable Price

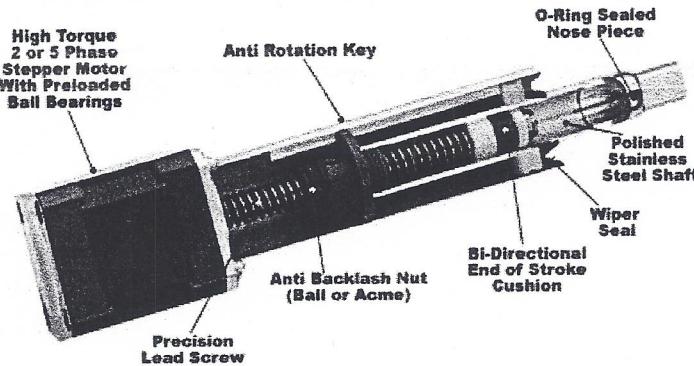
225 East Side Ave., Mattituck, NY 11952 Phone: 516-298-9179 Fax: 516-298-6593

[HOME](#)

[THE BUG](#)

[THE DIGIT](#)

[MORE INFORMATION](#)

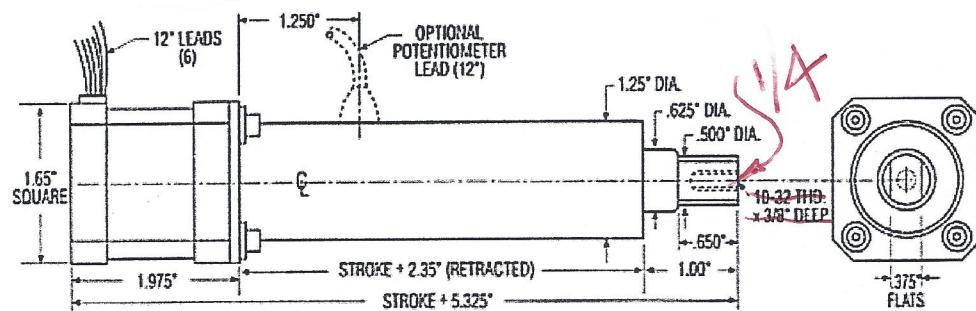


- Repeatability to +/- .00004 inches
- Thrust to 120 lbs.
- Speeds to 5 inches/sec.
- Resolution to .00004 inches/half step
- Environmentally sealed (clean room compatible)

- Strokes of 2, 4 or 8 inches
- Precision linear potentiometer option
- Optical encoder option
- Externally adjustable limit or home position switches
- Body: anodized aluminum
- Shaft: polished stainless steel
- Matching drivers & controllers available

LARGE motor
4 INCHES

Dimensions



Mounts

DPT-210
PDT-150 ± .001

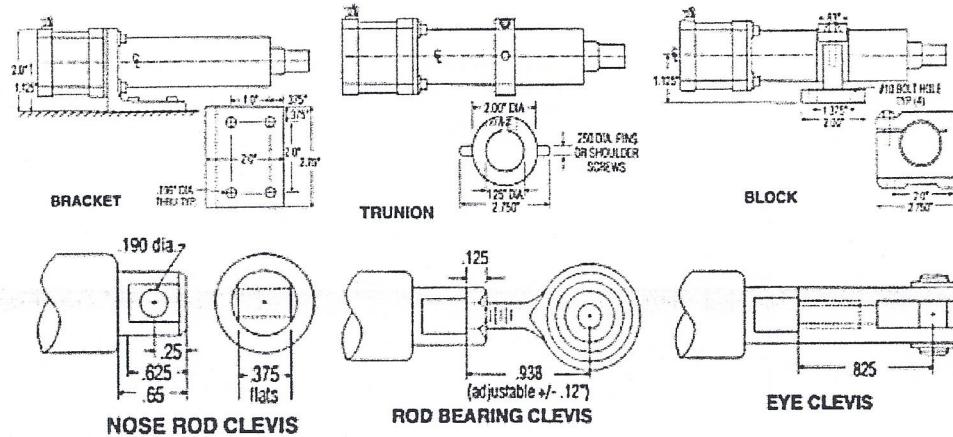
ANTI BACKLASH NUT 825

BASE 4500

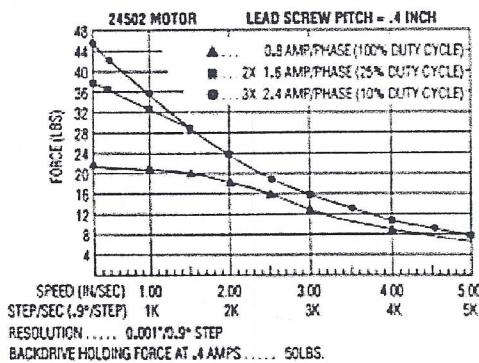
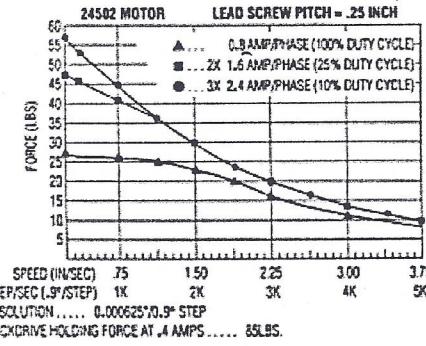
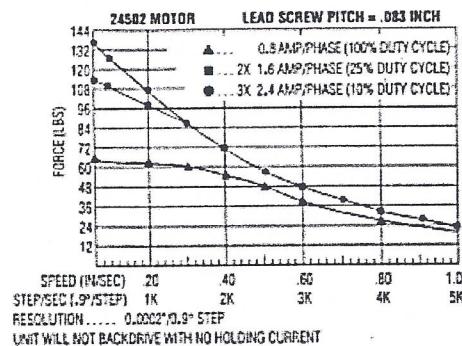
MOTOR 415

NEMA 25 300 LB FORCE ± 200

4 WEEKS AGO



Representative Speed/Force Curves



Ordering Information

D <u>D</u>	Lead Screw Pitch (in.) <u>B</u> .125 (Ball) A .080 (Acme) A .250 (Acme) A .400 (Acme)	Anti Backlash Nut <u>AB</u>	Motor Type 24601 24602 24603 544 534	Stroke (Inches) 2 4 8 etc.	Number of Home/Limit Switches 0 1 2 etc.
K	P	ES	T6 T9	Vacuum Prep 1C * TORR 10 * TORR	Mountings Base / Nose End / End
					RBC ... Rod Bearing Clevis EC Eye Clevis T Trunion B Block BR Bracket

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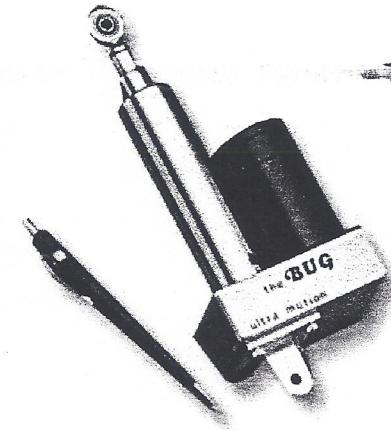
225 East Side Ave., Mattituck, NY 11952 Phone: 516-298-9179 Fax: 516-298-6593

Mini Linear Actuators

Ultra Motion's electromechanical mini-linear actuators generate high forces and precision positioning in small light packages and are an alternative to hydraulic and pneumatic systems.

They are increasingly chosen for low to moderate power applications where clean, quiet, reliability is important. In addition, they are usually less costly and simpler to use, eliminating pumps, compressors, filter, accumulators, valves, fluid lines and leaks.

Ultra Motion has combined state of the art materials and technology to offer what engineers want: reliable, cost effective precision.



THE BUG

Mini Linear Actuator

- Thrusts to 500 lbs.
- No Limit Switches Required
- Absolute Position Feedback Option
- Stepper Motor Option

THE DIGIT

Precision Miniature Stepper Actuator

- Thrusts to 120 lbs.
- Optical Encoder Option
- Matching Drivers & Controllers Available
- Precision Linear Potentiometer Option

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ULTRA MOTION 

High Precision At An
Affordable Price

225 East Side Ave., Mattituck, NY 11952 Phone: 516-298-9179 Fax: 516-298-6593

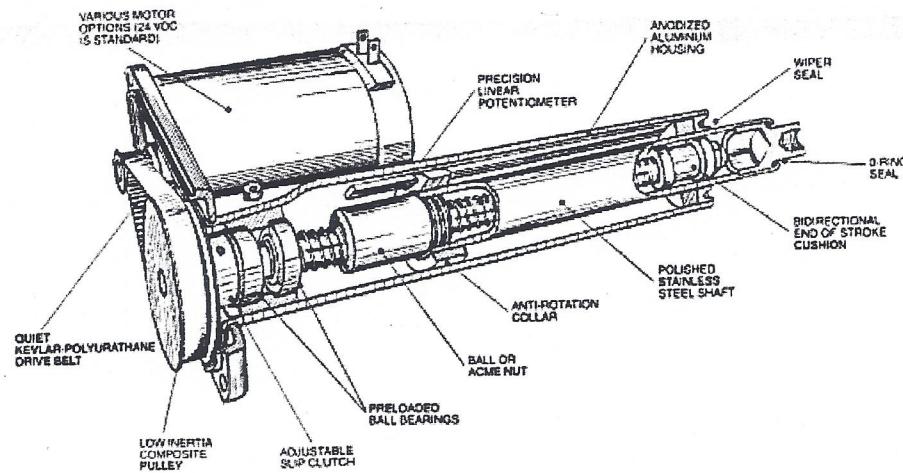
HOME

THE BUG

THE DIGIT

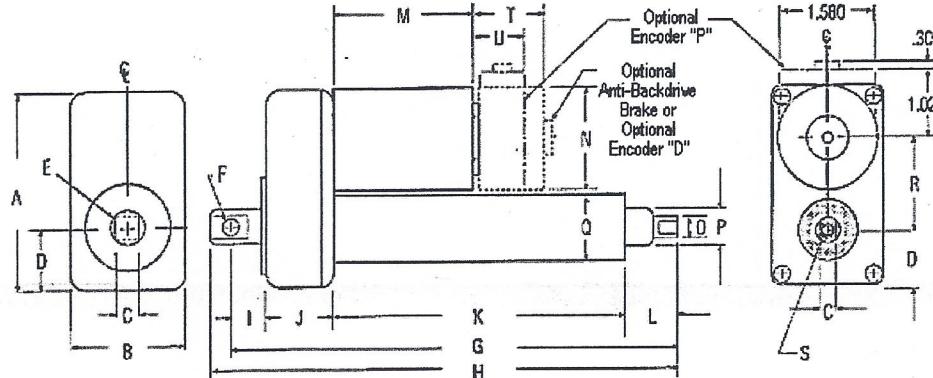
MORE INFORMATION

Cutaway of Actuator



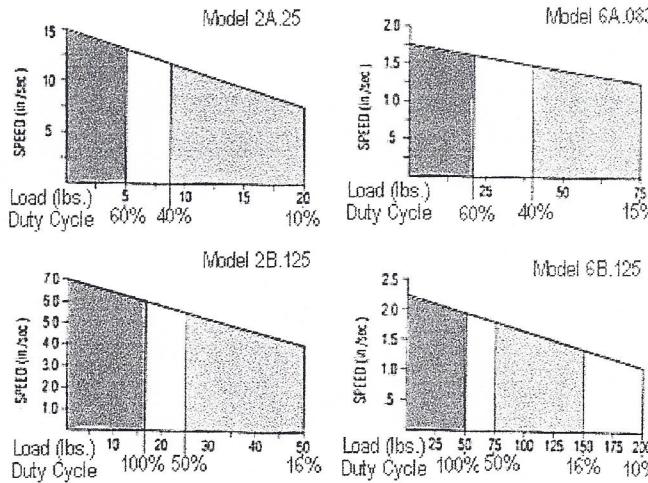
- Thrusts to 500 lbs.
- Speeds from .001 to 20 inches/sec.
- Precision linear potentiometer
- Absolute position feedback option
- Stroke limits set in controller
- No limit switches required
- Environmentally sealed for clean room applications
- Optical encoder option
- Stepper motor option
- Gear motor option for speeds below .8 inch/sec.
- 2", 4", and 8" stroke models
- Super quiet Kevlar-polyurethane drive belt
- Repeatability +/- .005 inches, +/- .002 with anti-backlash nut
- Life to over one million cycles
- Low system cost
- Wide range of mounting options
- Hall effect or reed limit switches available

Dimensions



Motor	A	B	C	D	E	F	G Retract	H Retract	I	J	K	L Retract	M	N	O	P	Q	R	S	T	UP UD	
DC	3.15	2.16				.375							2.40	1.58						1.460		
DC GEAR Stepper						Flats	1.00	.500 Dia.	.250 Dia.	Stroke	Stroke	.825	1.00	3.00	1.02	3.50	2.00	.438 Dia.	.625 Dia.	1.250 Dia.	1.80 Thrd.	10-32 Thrd.
DC 14S													1.85	1.65								
DC 14G													3.70	2.13								
													4.95									.98

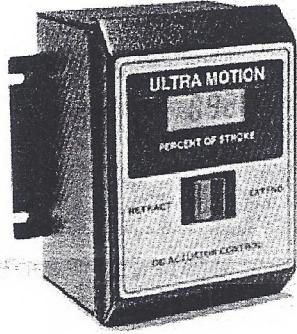
Representative Speed/Force Curves*



*Many other speeds/forces available

Controller

The Ultra Motion UM-1 controller is a simple, low cost unit now available with either constant or variable speed control.** It is ideally matched to the Bug series of actuators and provides precision at an affordable price.

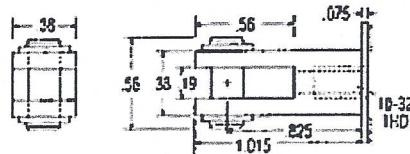


- 120 VAC input
- One 24 VDC output
- Stand alone or remote operation from a PLC or computer
- Digital LCD position readout
- Extend/retract momentary switch
- Dynamic Braking
- Travel limits set by internal trim pots (actuator need not be accessible)
- 4-20 MA current loop for remote meter
- Fuse Protected
- Speed control option

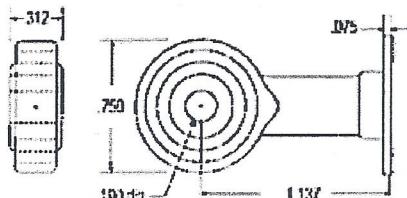
**Other controllers available

Mountings

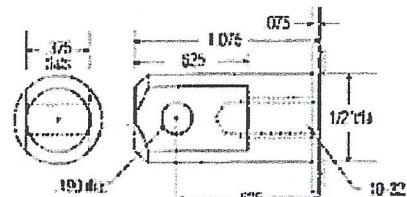
BASE



Eye Clevis

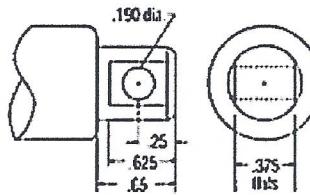


Red Bearing Clevis

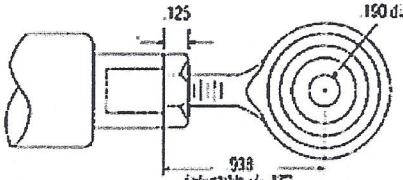


Rod Clevis

NOSE



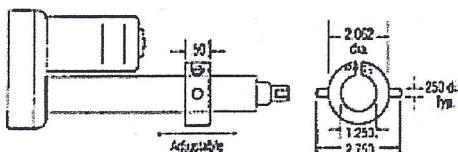
Nose Rod Clevis



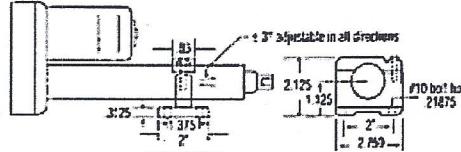
Rod Bearing Clevis



Eye Clevis



Trunion Mount



Block Mount

Ordering Information

Example (5---B.125---DCG 5.9---24---4---E 256---RC/RBC)

Belt Drive Ratio	Screw Ball Acme/Lead (in.)	Anti Backlash Nut	Motor Type	Motor Voltage	Stroke (inches)
2:1	B .125	AB	DC	6	2
3:1	A .083		DC143	12	4
4:1	A .250		DC146	24	8
5:1	A .400		DGG(R)*		ST

Linear Pot.	Keyed Shaft	Environmentally Sealed	Encoder	Brake	Ming Base/Nose
-------------	-------------	------------------------	---------	-------	----------------

P	K	ES	E(LC)**	BR	EC Eye Clevis RBC ... Rod Bearing Clevis RC Rod Clevis NRC ... Nose Rod Clevis T..... Trunion B Block
---	---	----	---------	----	--

*Standard Gear Ratios: 5.9, 19.7, 65.5, 218 **Standard Line Counts:
256, 360, 500, 512

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226 East Side Ave. Mattituck, NY 11952
Phone: 516 298 9179 Fax: 516 298 8593
<http://www.ultramotion.com>

Fax Cover Sheet

DATE: 3/26/99

PHONE: 520-621-1511

TO: WARREN DAVISON

FAX: -9843

FROM: ERWIN RODGER

RE:

Number of pages including cover sheet: 6

Message: WARREN,

Enclosed is info. on three of our drives. prices range from \$259 to \$475.

Best regards
Erwin Rodger

3540 SERIES DRIVES/CONTROLLERS

The 3540M is a pulse and direction microstepping drive built on a compact aluminum chassis with integral heat sink.

The 3540i is a microstepping drive with easy to use programmable indexer. Windows™ programming software and cable are included.



The 3540 series consists of a 3540M step motor drive, 3540MO drive/oscillator and 3540i drive/controller. All three products are designed around a precision state of the art, microstepping, motor drive capable of powering NEMA 14 through NEMA 34 frame size motors. Each device produces 122 watts of usable power and microsteps at resolutions up to 12,800 steps per revolution. Mi-

crostepping resolutions up to 50,800 steps/rev are available at motor speeds up to 50 rps on the 3540i. One of the main features of the 3540i is Applied Motion's "Simple Indexer Technology™" Windows™ graphical user interface. No program language to learn, no software engineer to consult, no code to write. The system does the programming, you need only input the move parameters.

Ultramotion

225 EAST SIDE AVE.
MATTITUCK, NY 11952 www.ultramotion.com
Phone: 516 298 9179 Fax: 516 298 6593

Technical Specifications

3540M - PULSE & DIRECTION DRIVE

Physical	1.5 x 3 x 4 inches, built on a black anodized aluminum chassis.
Connectors	Screw terminal blocks.
Inputs	Optically isolated, 5 - 12 VDC (24V requires external dropping resistors). Step: Drive makes one step per input pulse. Direction: Set direction of rotation. Enable: removes all motor current when active.
Step Resolutions	Switch selected: 400, 1000, 2000, 12800 steps/rev. Other resolutions are available. Consult the factory.
Current	Switch selected, 0.4 - 3.5 A.
Idle Current	Switch selected, 50% or 100%.
Power Supply	12 - 42 VDC.
Self Test	Switch selected.

3540MO - DIGITAL OSCILLATOR/JOYSTICK DRIVE

Physical	1.5 x 3 x 4 inches, built on a black anodized aluminum chassis.
Connectors	Screw terminal blocks.
Inputs	Optically isolated, 5 - 24 VDC. Run: tells drive to run or stop. Direction: sets direction of rotation. Speed: selects high speed (25 rps) or low speed (5 rps) range. Enable: removes all motor current when active. Wiper: 0 - 5V analog input for external speed signal, pot or joystick.
Internal Pots	Accel (1 - 250 rev/sec/sec), Low Speed (0 - 5 rps), High Speed (0 - 25 rps).
External Speed	Pot/Joystick 3 terminal type, 1k - 10k ohms.
Output	Tach: 5 - 24V optically isolated, 100 pulses per revolution.
Step Resolution	12800 steps/rev.
Current	Switch selected, 0.4 - 3.5 A.
Idle Current	Switch selected, 50% or 100%.
Power Supply	12 - 42 VDC.

3540I - INDEXER/DRIVE

Physical	1.5 x 3 x 5 inches, built on a black anodized aluminum chassis.
Connectors	Screw terminal blocks for power, motor, I/O. RJ11 for RS-232 port.
Serial Communications	RS-232 port, cable included.
Inputs	8 user programmable inputs, optically isolated, 5 - 24 VDC: • 2 dedicated limit switch inputs. • 4 general purpose inputs. Can be used for Feed to Sensor moves, homing, branching and triggering. • 2 jog inputs, can also be used as general purpose inputs.
Outputs	3 optically isolated 5-24V outputs for interfacing to other equipment.
Step Resolutions	Software selected: 2000, 5000, 10000, 12800, 18000, 20000, 21600, 25000, 25400, 25600, 36000, 50000, 50800 steps/rev.
Current	Software selected, 0.2 - 3.5 A.
Idle Current	Software selected, 0%, 25%, 50% or 100%.
Power Supply	12 - 42 VDC.
Parameter Ranges	Distance: 1 to 16,000,000 steps. Speed: .025 to 50 rev/sec. Acceleration: 1 to 3000 rev/sec/sec. Deceleration: 1 to 3000 rev/sec/sec (set independently from acceleration). Time delays: .01 to 300 seconds. Output pulse width: 2 to 500 milliseconds. Iterations per loop: 1 to 65,535. Loops per program: unlimited.
Optional Operator Terminal (MMI)	NEMA 4X rated (splash proof and dust proof). 4 x 20 character liquid crystal display (LCD). 20 key membrane keypad. Overall size: 4.9 x 4.9 x 1.42 inches.

3540i Software Specifications

INDEXER PROGRAMMING:

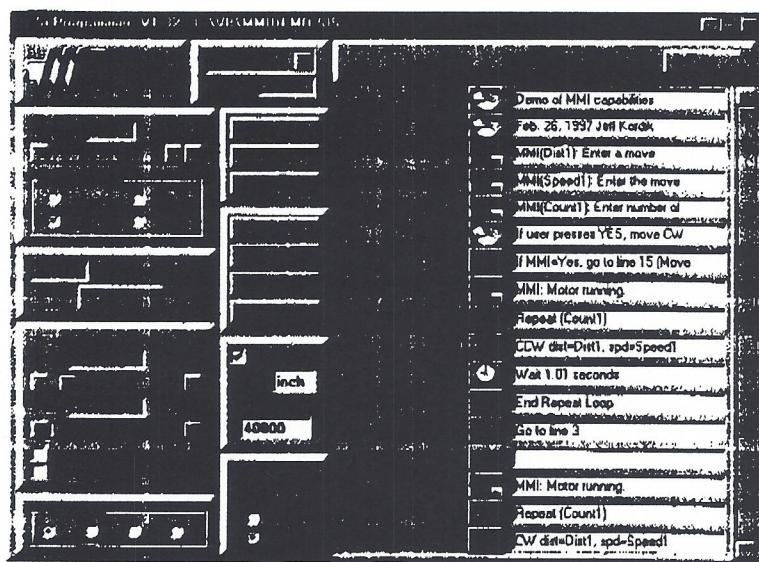
Programmable by RS-232 connection to IBM compatible PC running Windows 3.1 or Windows 95. Programming software and cable included. Pro-

grams, meeting the demands of a wide range of applications.

On the right of the main programming screen, as shown here, are the 100 program lines (you have to scroll down to see lines 18-100). In the center are command buttons and on the left are global parameters such as motor current and microstep resolution. Clicking on a program line icon brings up a sequence of dialog boxes, making program selection and parameter setting easy.

Once programmed, the cable can be removed and the indexer-drive will run stand alone. Programs and parameters are stored internally in nonvolatile memory. Upon power up, the drive automatically senses the connection to the Windows programming software. If no connection is detected, the program is automatically executed starting on line 1.

The 3540i is available with an optional NEMA 4X operator interface (MMI) that allows the operator to enter variables such as speeds, distances and repeat counts. The MMI attaches to the RS-232 programming port, leaving all inputs and outputs free.



MAIN PROGRAMMING SCREEN

The command button features include:

DOWNLOAD program to drive

SAVE program to disk

UPLOAD program from drive

LOAD program from disk

EXECUTE program

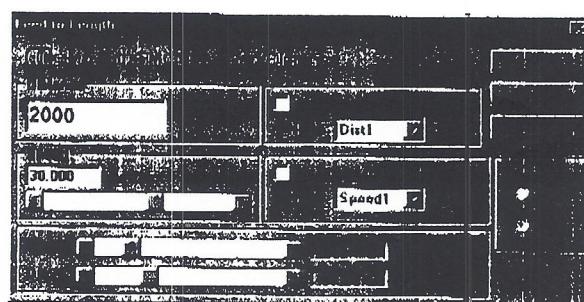
PRINT program

QUIT the programming software

Programming is very easy to learn and requires no previous programming experience.

Programs can be up to 100 lines long. Instructions are powerful, so 100 lines can provide the user with a sophisticated program. For example, in one program line the motor can be moved until a sensor changes state, then fed a precise distance to a stop, delayed and returned to the starting point. Distances, delays, feed and return speeds, acceleration and deceleration parameters are all included in the single program line. The same move can take 10 program lines or more on other indexers.

There are a total of 14 different instructions, including input/output, branches, loops and motion commands. These instructions can be combined to make a nearly infinite variety of pro-



TYPICAL DIALOG BOX
(for setting Feed to Length instruction)

3540i Program Instructions

Feed to Length

A point to point move. Parameters include distance, speed, direction, accel, and decel.

Feed & Return

A point to point move that returns to the starting point after specified delay. Parameters include distance, feed speed, return speed, direction, accel, decel, and return delay time.

Feed to Sensor

Feed until an input changes state, then feed a specified distance beyond the sensor before stopping. Useful for homing, or labeling or fluid filling applications. Parameters include distance, feed speed, direction, accel, decel, input number and input condition (low voltage, high voltage, rising edge or falling edge)

Wait Time

Delays a specified amount of time. Range is .01 to 300 seconds. Adding a loop around this instruction can extend the delay time to as much as 18 hours.

Wait Input

Pauses execution until an input reaches a given condition (high, low, rising edge or falling edge). The jog inputs are functional during this instruction.

If Input

Causes the program to branch to an instruction if an input is in a given state (high or low). This allows the user to store multiple parameters (such as two different move distances or speeds) and have the selection depend on a switch. This also allows for multiple, switch selected programs within the 100 line space.

Seek Home

Positions the motor at a home sensor (wired to one of the general purpose inputs) "bouncing off" the limits if necessary.

MMI Prompt

Display a prompt on the optional man-machine interface (MMI) panel and accept a parameter from the operator. This parameter is saved in nonvolatile memory and can be used as a speed, distance or repeat count. The MMI prompt can also scale the input data, allowing the operator to work in units such as inches or gallons.

Go To

Forces program to jump to a specific instruction. At the least, you'll need one of these at the end of your program to return execution to the beginning.

Repeat

The beginning of a loop. Repeat a block of instructions a fixed number of times (up to 65,535 times). Loops can be extended by nesting loops around each other (two nested loops allow you to repeat the instructions within them more than 4 billion times).

End Repeat

Marks the end of a repeat loop. The programming software matches these up for you automatically. You don't have to specify a line number. Connections are shown graphically on the screen.

Set Output

Set a given output to a high or low voltage state, or can emit a high or low pulse of 2 to 500 milliseconds. This instruction is useful for triggering other motor controllers, relays or cut-off knives. It can also be used to signal events to another indexer or PLC.

Feed to Sensor & Return

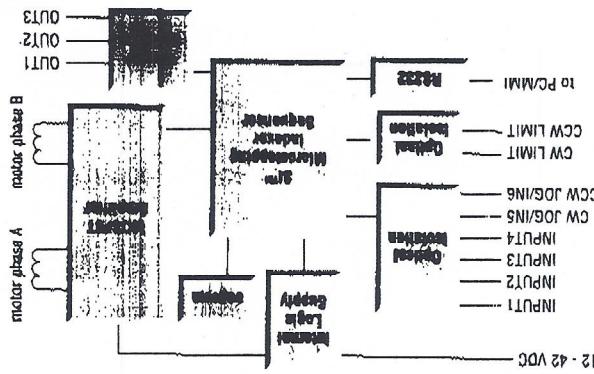
Same as Feed to Sensor, but returns to the original starting point. Additional parameters are return speed and return delay time.

Comment

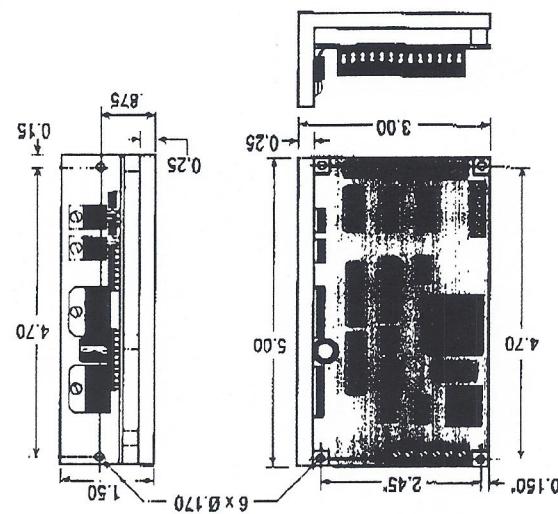
Allows the user to document the program by adding comments. Comments stay with the program even when downloaded to the drive.

Programs for the 3540i can also be run on the Si5580, 7080i, and Si100.

CE

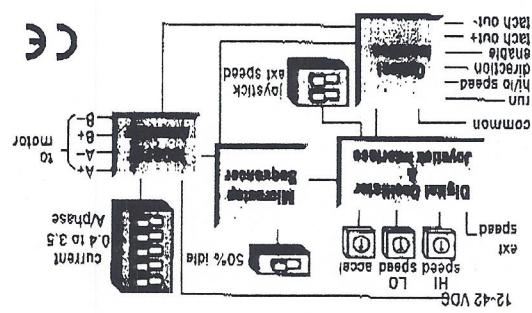


3540I BLOCK DIAGRAM

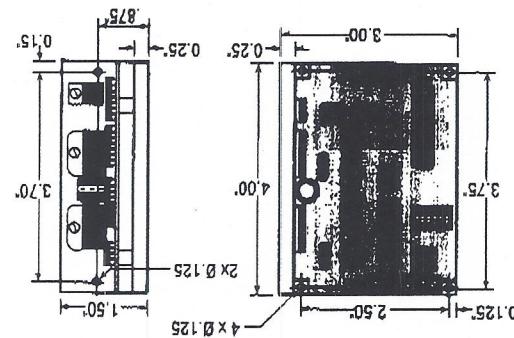


3540I MECHANICAL OUTLINE

CE

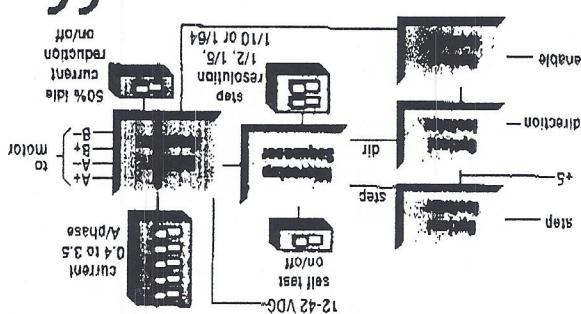


3540M0 BLOCK DIAGRAM

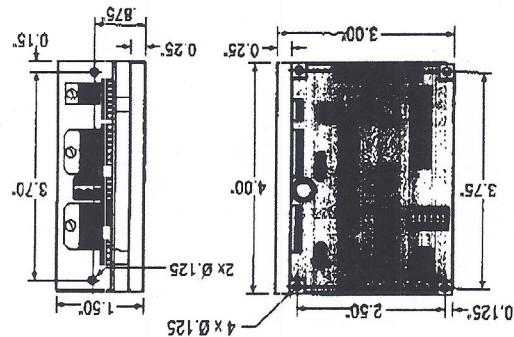


3540M0 MECHANICAL OUTLINE

CE

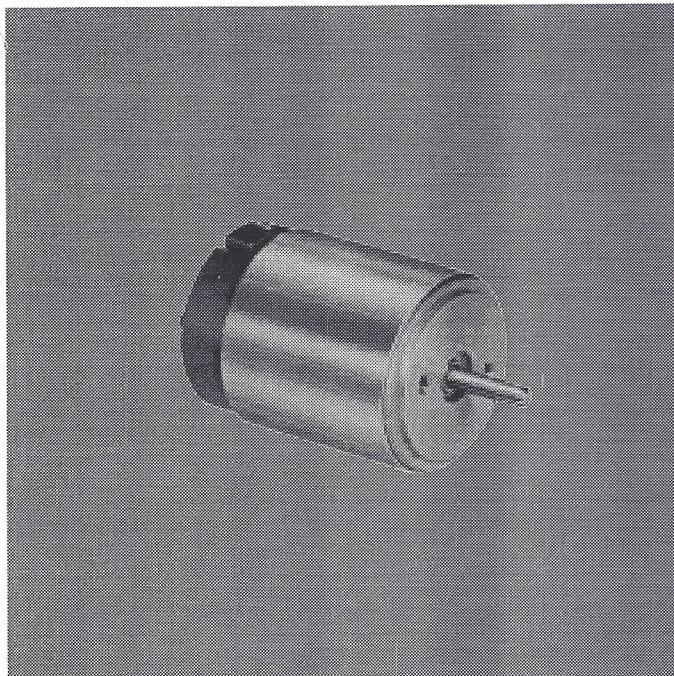


3540M BLOCK DIAGRAM

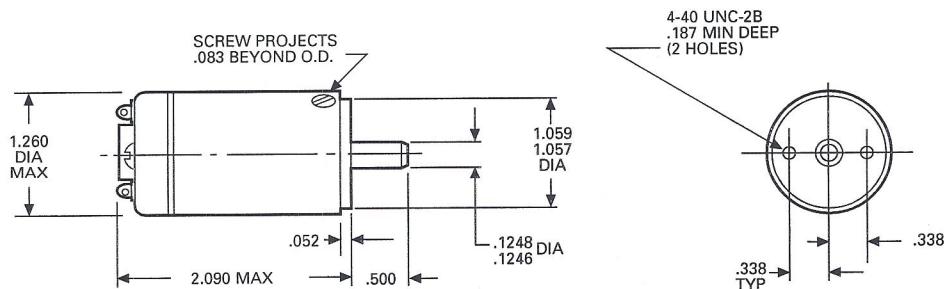


3540M MECHANICAL OUTLINE

Technical Drawings



Dimensions



ROTATION (VIEWED FROM SHAFT END)
CCW - POSITIVE VOLTAGE TO (+), NEGATIVE VOLTAGE TO (-)
CW - REVERSE POLARITY

NOTE: Consult factory prior to preparing spec control prints. Dimensions are for reference only

power rating: .015 hp (11.2 W)

voltage: 6 to 75 VDC

weight: 5.2 ounces

armature: Dynamically balanced

inertia: 7.4×10^{-5} oz. in. sec.²

electrical time constant: 0.5 millisecond max

mechanical time constant: 15.0 milliseconds max

typical no load torque: 0.5 oz. in.

shaft: Precision-ground stainless steel. Options: length, smaller diameter, flats, pinions, gears, holes (through or tapped), threaded ends and tapers. Type of steel used may change depending upon variation selected

magnets: Alnico V

bearings: Double shielded, life-lubricated

cover: Corrosion-resistant aluminum

frame: Die-cast aluminum

end bell: Precision-molded, fiberglass-filled Dialyl Phthalate

winding temperature rise: 7°C per watt w/8.00" x 8.00" x .25" aluminum heat sink

winding insulation rating: 130°C (higher temperature windings available)

options available:

- Gear train (see Bulletin E-2030)

Standard Part Numbers and Data

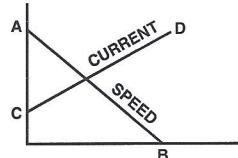
VOLTAGE (VDC)	SPEED no load (rpm)	TORQUE		CURRENT			CONSTANTS		STANDARD PART NUMBERS*
		max rated (oz. in.)	theoretical stall (oz. in.)	max no load (amps)	max rated load (amps)	nominal stall (amps)	K _T (oz. in./amp)	R (ohms)	
6	7,600-9,400	1.60	5.5	.70	2.00	7.00	.90	.80	313A102-5
12	11,500-14,000	1.10	8.7	.52	1.70	8.40	1.20	1.35	313A102-24
12	9,000-11,000	1.70	6.9	.42	1.20	5.30	1.51	2.13	313A102-3
24	16,000-19,000	.75	11.0	.36	1.00	7.30	1.74	3.12	313A102-21
24	14,400-17,000	.85	11.0	.32	.85	6.50	1.96	3.50	313A102-4
24	12,000-14,500	1.00	8.7	.28	.80	4.50	2.26	5.08	313A102-7
24	10,400-12,300	1.10	6.9	.23	.75	3.30	2.71	7.68	313A102-1
24	7,400-8,900	1.60	5.5	.17	.70	1.70	3.77	13.43	313A102-2
24	6,900-8,200	1.80	4.3	.16	.65	1.20	4.05	18.28	313A102-8
24	6,200-7,400	1.80	3.4	.14	.60	.89	4.52	25.59	313A102-22
24	5,200-6,200	1.20	3.4	.12	.45	.74	5.42	30.70	313A102-10
50	7,600-9,400	1.50	7.5	.09	.25	.92	7.25	51.55	313A102-11
75	14,000-17,000	1.00	8.6	.10	.29	1.60	6.33	45.10	313A102-25
75	9,000-11,000	1.70	6.8	.07	.29	.85	9.36	84.10	313A102-16
75	8,000-10,000	1.80	5.4	.06	.26	.60	10.56	119.40	313A102-12
75	6,500-8,000	1.20	4.3	.05	.20	.37	13.58	194.00	313A102-15
75	4,500-5,300	1.00	3.4	.04	.10	.23	16.89	303.00	313A102-13

*Because of brush drop and field distortion, current and torque indicated will not always be attainable

*When You Order

Units shown above are standard and may be ordered by part number.
Remember to include armature winding dash number, EXAMPLE:
313A102-1

How To Draw Speed Torque Curve

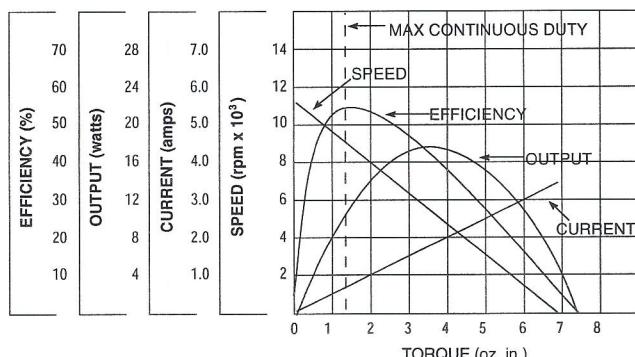


- A no load speed (nominal) (rpm)
- B stall torque (oz. in.)
- C no load current (amps)
- D stall current (amps)

Typical Performance

Part No.: 313A102-1

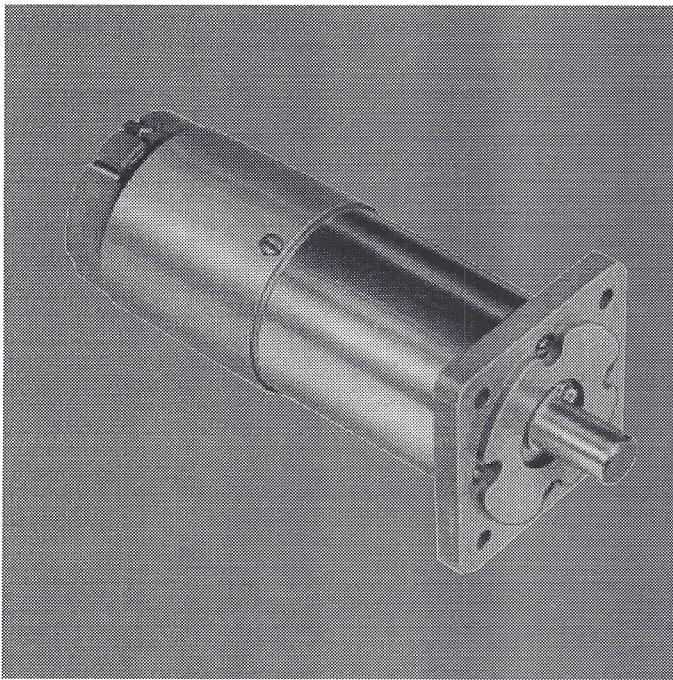
Voltage: 24 VDC



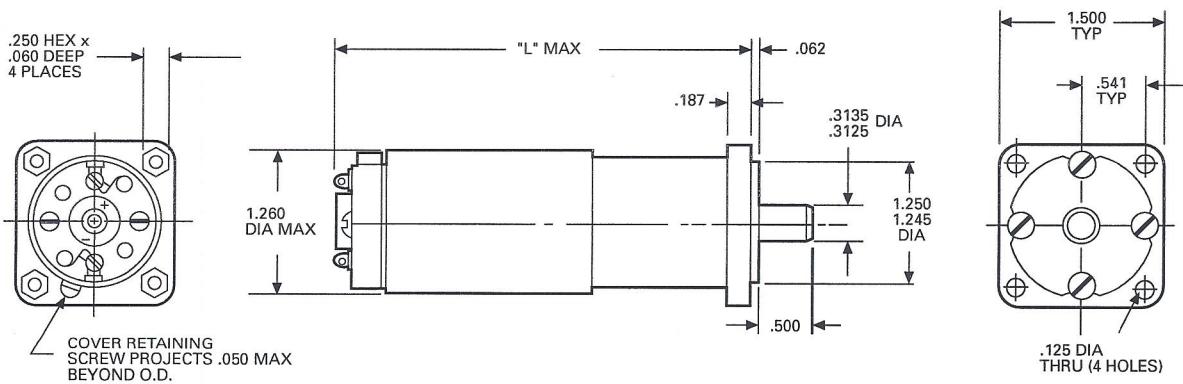
CMM & CLL GEARMOTORS

DC Permanent Magnet Planetary Gearmotors

E-2030



Dimensions



ROTATION (VIEWED FROM SHAFT END)
CCW - POSITIVE VOLTAGE TO (+), NEGATIVE VOLTAGE TO (-)
CW - REVERSE POLARITY

NOTE: Consult factory prior to preparing spec control prints. Dimensions are for reference only

Standard Part Numbers and Data

SPEED REDUCTION RATIO	TORQUE MULTIPLIER	MAX CONT. TORQUE (oz. in.)	TYPE CMM GEARMOTOR		TYPE CLL GEARMOTOR	
			Dim. "L" (in.)	STANDARD PART NUMBER PREFIX*	Dim. "L" (in.)	STANDARD PART NUMBER PREFIX*
4:1	3.0	5.1	2.86	317A102	3.22	319A100
5:1	3.8	6.5	2.86	317A103	3.22	319A101
6:1	4.5	7.7	2.86	317A104	3.22	319A102
16:1	10.0	17.0	3.11	317A105	3.45	319A103
20:1	13.0	22.0	3.11	317A106	3.45	319A104
24:1	15.0	26.0	3.11	317A107	3.45	319A105
25:1	16.0	27.0	3.11	317A108	3.45	319A106
30:1	19.0	32.0	3.11	317A109	3.45	319A107
36:1	23.0	39.0	3.11	317A110	3.45	319A108
64:1	33.0	56.0	3.34	317A111	3.69	319A109
80:1	41.0	70.0	3.34	317A112	3.69	319A110
96:1	49.0	83.0	3.34	317A113	3.69	319A111
100:1	51.0	87.0	3.34	317A114	3.69	319A112
120:1	61.0	104.0	3.34	317A115	3.69	319A113
125:1	64.0	109.0	3.34	317A116	3.69	319A114
144:1	74.0	126.0	3.34	317A117	3.69	319A115
150:1	77.0	131.0	3.34	317A118	3.69	319A116
180:1	92.0	156.0	3.34	317A119	3.69	319A117
216:1	110.0	187.0	3.34	317A120	3.69	319A118
256:1	105.0	179.0	3.58	317A121	3.92	319A119
320:1	130.0	221.0	3.58	317A122	3.92	319A120
384:1	157.0	167.0	3.58	317A123	3.92	319A121
400:1	164.0	279.0	3.58	317A124	3.92	319A122
480:1	197.0	335.0	3.58	317A125	3.92	319A123
500:1	205.0	349.0	3.58	317A126	3.92	319A124
576:1	235.0	401.0	3.58	317A127	3.92	319A125
600:1	246.0	418.0	3.58	317A128	3.92	319A126
625:1	256.0	435.0	3.58	317A129	3.92	319A127
720:1	295.0	502.0	3.58	317A130	3.92	319A128
750:1	306.0	520.0	3.58	317A131	3.92	319A129
864:1	352.0	598.0	3.58	317A132	3.92	319A130
900:1	370.0	629.0	3.58	317A133	3.92	319A131
1,024:1	334.0	568.0	3.81	317A134	4.16	319A132
1,080:1	442.0	757.0	3.58	317A135	3.92	319A133
1,280:1	416.0	707.0	3.81	317A136	4.16	319A134
1,296:1	530.0	901.0	3.58	317A137	3.92	319A135
1,536:1	500.0	850.0	3.81	317A138	4.16	319A136
1,600:1	522.0	887.0	3.81	317A139	4.16	319A137
1,920:1	625.0	1,063	3.81	317A140	4.16	319A138
2,000:1	652.0	1,108	3.81	317A141	4.16	319A139
2,304:1	750.0	1,250	3.81	317A142	4.16	319A140
2,400:1	780.0	1,250	3.81	317A143	4.16	319A141
2,500:1	815.0	1,250	3.81	317A144	4.16	319A142
2,880:1	940.0	1,250	3.81	317A145	4.16	319A143
3,000:1	980.0	1,250	3.81	317A146	4.16	319A144
3,125:1	1,020	1,250	3.81	317A147	4.16	319A145
3,456:1	1,130	1,250	3.81	317A148	4.16	319A146
3,600:1	1,170	1,250	3.81	317A149	4.16	319A147
3,750:1	1,220	1,250	3.81	317A150	4.16	319A148
4,096:1	1,070	1,250	4.03	317A151	4.39	319A149
4,320:1	1,410	1,250	3.81	317A152	4.16	319A150
4,500:1	1,470	1,250	3.81	317A153	4.16	319A151
5,120:1	1,340	1,250	4.03	317A154	4.39	319A152
5,184:1	1,690	1,250	3.81	317A155	4.16	319A153
5,400:1	1,760	1,250	3.81	317A156	4.16	319A154

*NOTE: Standard part numbers and data continued on page 12 and 13

CMM & CLL GEARMOTORS

DC Permanent Magnet Planetary Gearmotors

E-2030

Standard Part Numbers and Data

SPEED REDUCTION RATIO	TORQUE MULTIPLIER	MAX CONT. TORQUE (oz. in.)	TYPE CMM GEARMOTOR		TYPE CLL GEARMOTOR	
			Dim. "L" (in.)	STANDARD PART NUMBER PREFIX*	Dim. "L" (in.)	STANDARD PART NUMBER PREFIX*
6,144:1	1,610	1,250	4.03	317A157	4.39	319A155
6,400:1	1,680	1,250	4.03	317A158	4.39	319A156
6,480:1	2,110	1,250	3.81	317A159	4.16	319A157
7,680:1	2,010	1,250	4.03	317A160	4.39	319A158
7,776:1	2,530	1,250	3.81	317A161	4.16	319A159
8,000:1	2,100	1,250	4.03	317A162	4.39	319A160
9,216:1	2,390	1,250	4.03	317A163	4.39	319A161
9,600:1	2,520	1,250	4.03	317A164	4.39	319A162
10,000:1	2,620	1,250	4.03	317A165	4.39	319A163
11,520:1	3,010	1,250	4.03	317A166	4.39	319A164
12,000:1	3,140	1,250	4.03	317A167	4.39	319A165
12,500:1	3,280	1,250	4.03	317A168	4.39	319A166
13,824:1	3,620	1,250	4.03	317A169	4.39	319A167
14,400:1	3,780	1,250	4.03	317A170	4.39	319A168
15,000:1	3,940	1,250	4.03	317A171	4.39	319A169
15,625:1	4,100	1,250	4.03	317A172	4.39	319A170
17,280:1	4,520	1,250	4.03	317A173	4.39	319A171
18,000:1	4,710	1,250	4.03	317A174	4.39	319A172
18,750:1	4,910	1,250	4.03	317A175	4.39	319A173
20,736:1	5,430	1,250	4.03	317A176	4.39	319A174
21,600:1	5,660	1,250	4.03	317A177	4.39	319A175
22,500:1	4,900	1,250	4.03	317A178	4.39	319A176
25,920:1	6,790	1,250	4.03	317A179	4.39	319A177
27,000:1	7,070	1,250	4.03	317A180	4.39	319A178
31,104:1	8,150	1,250	4.03	317A181	4.39	319A179
32,400:1	8,500	1,250	4.03	317A182	4.39	319A180
38,880:1	10,200	1,250	4.03	317A183	4.39	319A181
46,656:1	12,200	1,250	4.03	317A184	4.39	319A182

Maximum continuous rated torque values are based upon motor temperature rise considerations. Starting or impact loads greater than 10 times the rated maximum continuous torque (1,500 oz. in. maximum) could result in gear or shaft damage.

*When You Order

Each of the basic motor armature windings (see chart, next page) can be used with any of the gear ratios listed in the two preceding charts. To order, state the gear train standard part number prefix, plus a motor armature winding dash number. EXAMPLE: 317A112-24 is a 80:1 CMM gear train with a "-24" armature winding, 12 volts, 18,000 rpm, .50 oz. in. torque, etc.

Basic Motor Data

VOLTAGE (VDC)	SPEED no load (rpm)	TORQUE		CURRENT			CONSTANTS		STANDARD PART NUMBERS*
		max rated (oz. in.)	** theoretical stall (oz. in.)	max no load (amps)	max rated load (amps)	nominal stall (amps)	K _T (oz. in./amp)	R (ohms)	

Type CMM Motors

6	12,000-14,000	.75	4.5	1.120	2.00	9.9	.58	.66	-5
12	18,000-21,400	.50	6.8	.820	1.20	11.8	.77	1.11	-24
12	14,500-17,000	.70	4.0	.700	1.20	7.5	.97	1.75	-3
12	12,400-14,700	.75	4.7	.610	1.20	5.1	1.12	2.56	-21
12	11,000-13,000	1.00	4.0	.520	1.20	4.6	1.26	2.87	-4
24	19,200-22,800	.35	7.3	.470	.60	6.3	1.45	4.17	-7
24	16,000-19,000	.60	4.8	.370	.60	3.8	1.74	6.30	-1
24	11,500-14,000	1.00	4.0	.260	.60	2.1	2.42	11.02	-2
24	10,700-12,700	1.00	4.1	.225	.60	1.6	2.60	15.00	-8
24	9,600-11,400	1.00	3.6	.220	.50	1.1	2.90	21.00	-22
24	8,000-10,000	1.00	3.0	.190	.45	.93	3.48	25.20	-10
24	6,000-7,000	.80	2.4	.140	.30	.55	4.65	42.30	-11
50	14,300-17,000	.70	5.4	.160	.30	1.30	4.06	37.00	-25
50	9,500-11,500	1.00	3.5	.120	.30	.71	6.00	69.00	-16
50	8,000-10,000	1.00	2.8	.100	.20	.50	6.77	98.00	-12
50	6,700-8,000	.80	2.5	.080	.16	.30	8.71	159.00	-15
50	4,600-5,500	.80	1.7	.060	.12	.20	10.83	249.00	-13

Type CLL Motors

6	7,600-9,400	1.60	6.0	.860	2.00	7.00	.90	.80	-5
12	11,500-14,000	1.10	8.0	.730	1.70	8.40	1.20	1.35	-24
12	9,000-11,000	1.70	5.2	.510	1.20	5.30	1.51	2.13	-3
24	16,000-19,000	.75	8.8	.530	1.00	7.30	1.74	3.12	-21
24	14,000-17,000	.85	7.8	.440	.85	6.50	1.96	3.50	-4
24	12,000-14,500	1.00	7.5	.380	.80	4.50	2.26	5.08	-7
24	10,400-12,300	1.10	6.2	.320	.75	3.30	2.71	7.68	-1
24	7,400-8,900	1.60	5.5	.240	.70	1.70	3.77	13.43	-2
24	6,900-8,200	1.80	3.8	.210	.65	1.20	4.05	18.28	-8
24	6,200-7,400	1.80	3.4	.190	.60	.89	4.52	25.59	-22
24	5,200-6,200	1.20	4.8	.170	.45	.74	5.42	30.70	-10
50	7,600-9,400	1.50	7.5	.110	.25	.92	7.25	51.55	-11

**Because of brush drop and field distortion, current and torque indicated will not always be attainable

***When You Order**

Each of the basic motor armature windings can be used with any of the gear ratios listed in the preceding charts. To order, state the gear train standard part number prefix, plus a motor armature winding dash number. EXAMPLE: 317A112-24 is a 80:1 CMM gear train with a "-24" armature winding, 12 volts, 18,000 rpm, .50 oz. in. torque, etc.

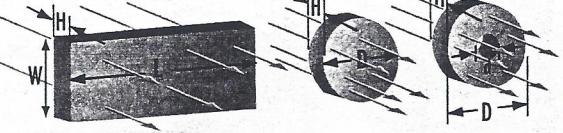
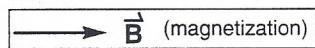
90 PRIME FILTER WHEEL Top Box FILTER Holder

RARE EARTH (NEODYMIUM AND SmCo)

Neodymium and Samarium Cobalt offer the highest energy magnetic fields available in permanent magnets. These are ideal for applications that require high energy, but are space limited.

SENOR MAGNET & HOLES

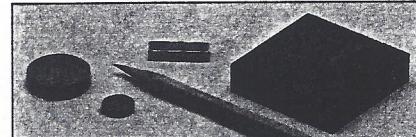
KEY



NEODYMIUM IRON BORON (NdFeB)

- Extremely Strong
- Cost Effective
- High Resistivity to Demagnetization

The Neodymium Iron Boron material is relatively expensive, but its high energy output makes it extremely cost effective. For this reason, these are used in many demanding assembly and industrial applications where price is a concern.



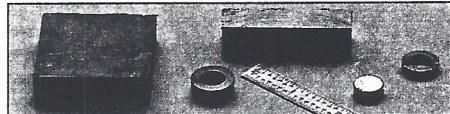
MAGNETS

Shape	D/L	W/d	H	Material	Gauss	Stock Number	Price 1-5	Price 6-10	Price 11+
Disc	0.125	—	0.0625	NdFeB 36	12,200	L54-303	\$2.80	\$2.50	\$2.20
Disc	0.1875	—	0.0625	NdFeB 37	1.25 lbs. lift	L38-428	\$2.50	\$2.30	\$2.20
Disc	0.25	—	0.125	NdFeB 37	1.75 lbs. lift	L38-429	\$4.60	\$4.10	\$3.90
Disc	0.375	—	0.2	NdFeB 37	3.5 lbs. lift	L35-104	\$5.10	\$4.60	\$4.30
Disc	0.5	—	0.125	NdFeB 37	5.5 lbs. lift	L35-105	\$9.70	\$8.80	\$8.30
Disc	0.75	—	0.1875	NdFeB 37	11.0 lbs. lift	L35-106	\$15.40	\$13.90	\$13.10
Disc	1	—	0.25	NdFeB 37	15.0 lbs. lift	L35-107	\$25.70	\$23.10	\$21.80
Disc	2	—	0.25	NdFeB 36	1,500	L54-304	\$82.40	\$74.10	\$70.00
Disc	3	—	0.5	NdFeB 36	2,000	L54-305	\$173.00	\$155.70	\$147.00
Rectangle	0.5	0.5	0.125	NdFeB 36	12,200	L54-306	\$5.10	\$4.60	\$4.30
Rectangle	1	0.5	0.125	NdFeB 36	12,200	L54-307	\$10.30	\$9.20	\$8.70
Rectangle	1	1	0.125	NdFeB 36	12,200	L54-308	\$19.80	\$17.80	\$16.80
Rectangle	2	0.5	0.125	NdFeB 36	12,200	L54-310	\$16.90	\$15.20	\$14.50
Rectangle	2	1	0.5	NdFeB 36	12,200	L54-311	\$83.40	\$75.00	\$70.90
Rectangle	2	2	0.5	NdFeB 27	2,500	L38-430	\$123.60	\$111.20	\$105.00

SAMARIUM COBALT (SmCo)

- Extremely Strong
- High Resistance to Demagnetization
- Ideal For High Heat Applications

The Samarium Cobalt material is more stable than the NdFeB and, therefore, more appropriate for high temperature applications (250-300°C).



Shape	L/D	W/d	H	Material	Gauss	Stock Number	Price 1-5	Price 6-10	Price 11+
Disc (Pk 2)	0.25	—	0.20	SmCo mixed	3700	L35-275	\$9.20	\$8.30	\$7.80
Disc	0.375	—	0.25	SmCo 16	3000	L54-313	\$10.00	\$9.00	\$8.50
Disc	0.5	—	0.25	SmCo 16	3000	L54-314	\$17.20	\$15.50	\$14.60
Disc	0.5	—	0.20	SmCo mixed	2500	L52-867	\$10.80	\$9.70	\$8.20
Disc	0.75	—	0.25	SmCo mixed	3000	L30-963	\$48.40	\$43.50	\$41.10
Disc	0.75	—	0.25	SmCo mixed	2500	L30-962	\$25.40	\$22.90	\$21.70
Rectangle	1	0.5	0.25	SmCo 16	Unknown	L54-319	\$36.00	\$32.40	\$30.60
Rectangle	1	1	0.25	SmCo mixed	2200	L30-779	\$69.50	\$62.50	\$59.10
Rectangle	1.938	1.938	0.50	SmCo mixed	Unknown	L52-225	\$30.30	\$27.30	\$25.80
Rectangle	2.25	0.55	0.60	SmCo mixed	8500	L30-964	\$128.70	\$115.80	\$109.40
Ring	0.64	0.385	0.145	SmCo mixed	6700	L31-571	\$11.30	\$10.10	\$9.60
Ring	0.75	0.43	0.25	SmCo mixed	8000	L30-730	\$27.80	\$25.00	\$23.60

ALNICO MAGNETS

Composition of Aluminum, Nickel, and Cobalt makes the Alnico magnet relatively strong and highly stable. These economical magnets are beneficial for high heat applications, but are susceptible to demagnetization.



CYLINDER

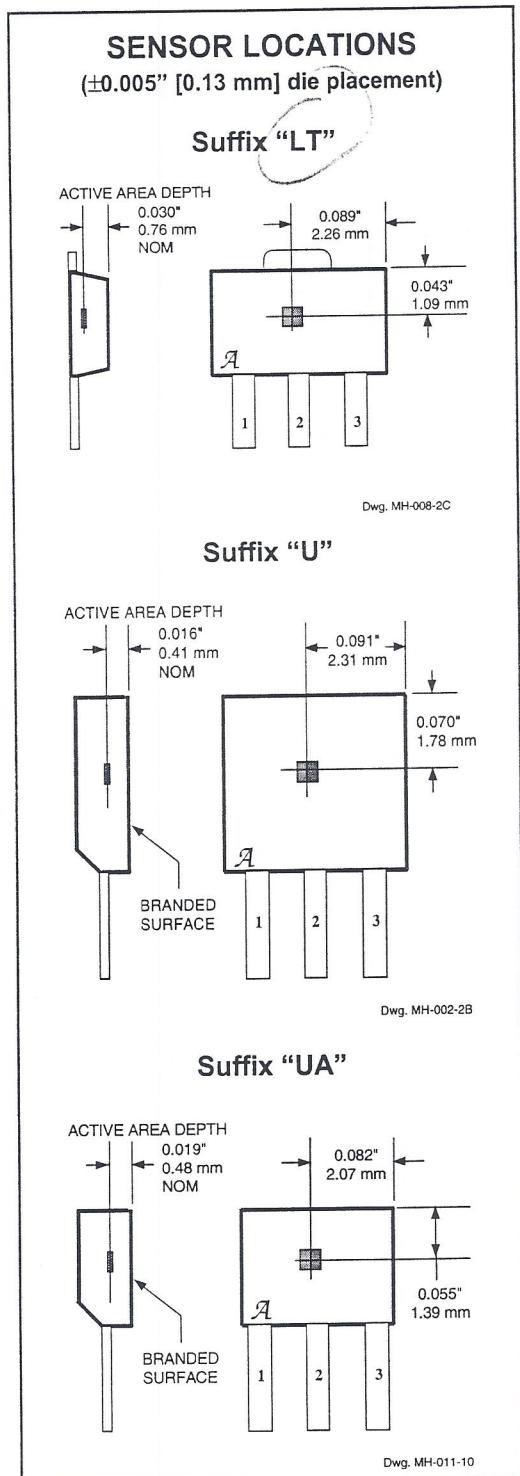
Shape	Size (Inches)	Thickness	Lift	Comments	Magnetized Side	Qty. Per Package	Stock Number	Price 1-5	Price 6-10	Price 11+
Cylinder	3/16 dia.	1"	- 6 oz.	Centerless ground-Alnico V	Unknown	4	L53-564	\$11.80	\$10.60	\$10.00
Cylinder	5/16 dia.	1" Long	1 lb.	—	End	10	L31-882	\$25.70	\$23.10	\$21.80
Cylinder	3/8 dia.	5"	14 oz.	Alnico II-good demonstrator	End	2	L60-131	\$20.50	\$18.40	\$17.40
Cylinder	1/4 dia.	13/16" Long	2 lbs 2 oz	Centerless ground-Alnico V	End	2	L40-418	\$10.50	\$9.50	\$9.00

SPARE MAGNETS FOR 61"
GUIDER BOX FILTER WHEEL

Supplier - EDMUND SCIENTIFIC
NEODYMIUM - IRON - BORON
.182 Dia. ($\frac{3}{16}$) \$ 3.75 EA.
.061 HEIGHT ($\frac{1}{16}$)

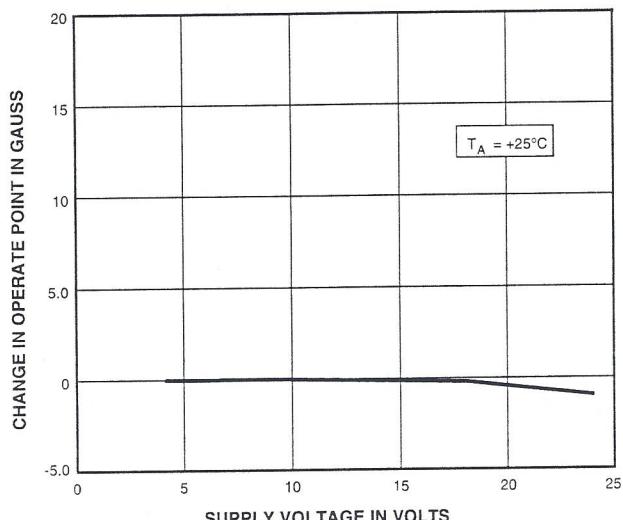
JAN 97 BTM

3141 THRU 3144
SENSITIVE
HALL-EFFECT SWITCHES
FOR HIGH-TEMP. OPERATION



TYPICAL OPERATING CHARACTERISTICS (cont.)

CHANGE IN OPERATE POINT



OPERATION

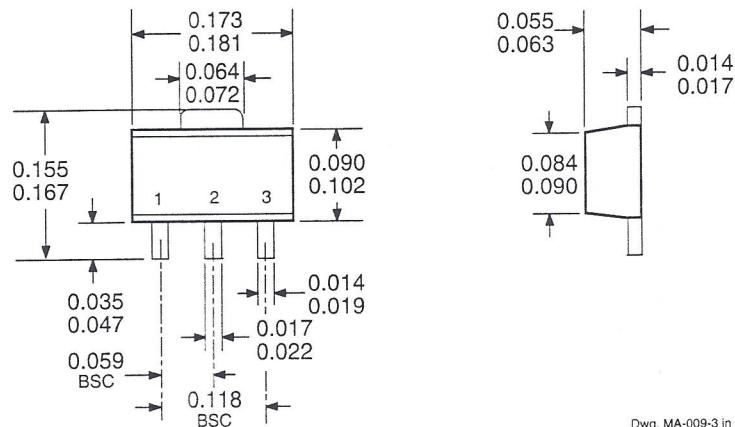
The output of these devices (pin 3) switches low when the magnetic field at the Hall sensor exceeds the operate point threshold (B_{OP}). At this point, the output voltage is $V_{OUT(SAT)}$. When the magnetic field is reduced to below the release point threshold (B_{RP}), the device output goes high. The difference in the magnetic operate and release points is called the hysteresis (B_{hys}) of the device. This built-in hysteresis allows clean switching of the output even in the presence of external mechanical vibration and electrical noise.

90° Top Box FILTER
 Holper Sensor

**3141 THRU 3144
SENSITIVE
HALL-EFFECT SWITCHES
FOR HIGH-TEMP. OPERATION**

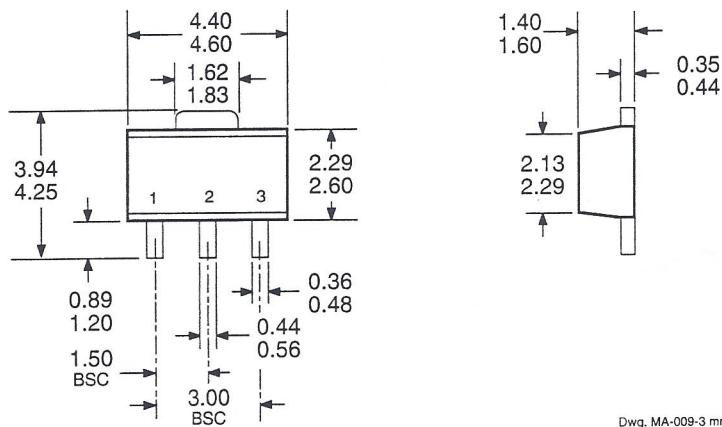
PACKAGE DESIGNATOR 'LT'
(SOT-89/TO-243AA)

Dimensions in Inches
(for reference only)



Dwg. MA-009-3 in

Dimensions in Millimeters
(controlling dimensions)



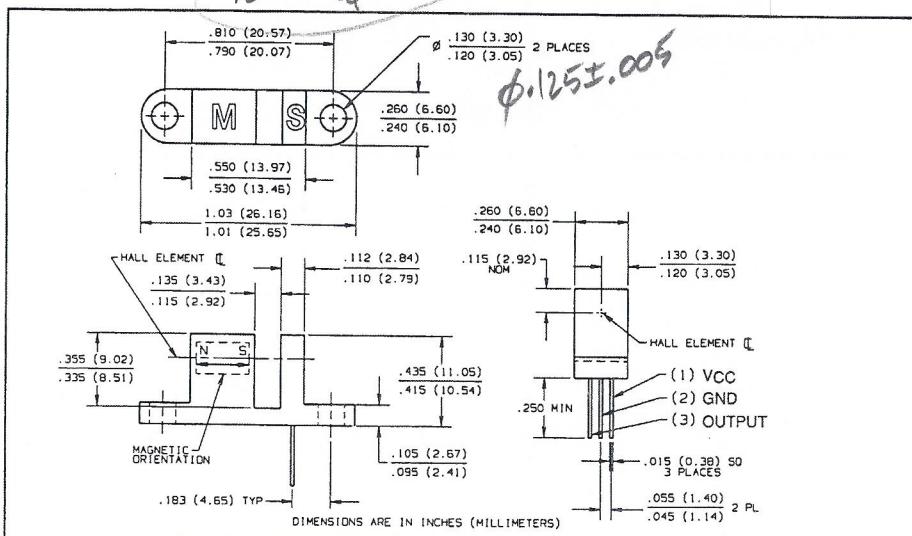
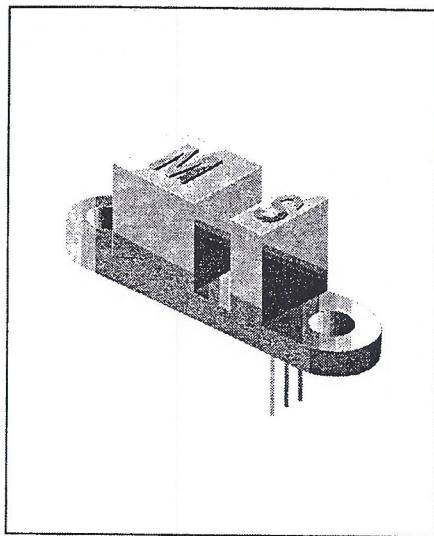
Dwg. MA-009-3 mm

- NOTES:

 1. Tolerances on package height and width represent allowable mold offsets. Dimensions given are measured at the widest point (parting line).
 2. Exact body and lead configuration at vendor's option within limits shown.
 3. Height does not include mold gate flash.

Hallogic® Hall Effect Sensor Assembly

Type OHB900



Features

- Non-contact motion sensing
- Operates over a broad range of supply voltages
- Excellent temperature stability
- Hall element, linear amplifier, and Schmitt trigger on a single Hallogic® silicon chip
- Performs in high dust and dirt environments
- 0.125" (3.18mm) wide gap

Description

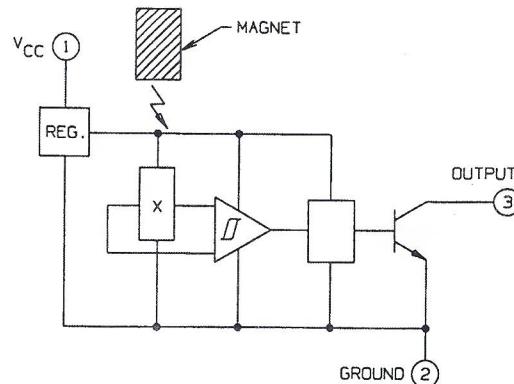
The OHB900 consists of a Hall Effect sensor similar to the OH180U and a rare earth magnet mounted in a low cost plastic housing. The magnet produces optimum magnetic flux at the Hall Effect sensor location. The sensor has an open collector transistor output which is activated when the slot is open. When the slot is blocked by a ferrous material, reducing the magnetic flux density at the Hall Effect sensor location, the open collector output transistor switches off. The device provides up to 25 mA of sink current. Output characteristics are constant at switching frequencies from DC to over 200 kHz.

Absolute Maximum Ratings (TA = 25° C unless otherwise noted)

Supply Voltage, Vcc	25 V
Storage Temperature Range, Ts	-50° C to +160° C
Operating Temperature Range, TA	-50° C to +150° C
Lead Soldering Temperature [1/8 inch (3.2 mm) from case for 5 sec. with soldering iron]	260° C
Output ON Current, ISINK	25 mA
Output OFF Voltage, VOUT	25 V
Magnetic Flux Density, B	Unlimited

Sensor Functional Block Diagram

ROTATION SENSOR FOR
90 PRIME TOP BOX
FILTER WHEEL



Type OHB900

Electrical Characteristics (V_{CC} = 4.5 V to 24 V, T_A = 25° C unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
I _{CC}	Supply Current		4	7	mA	V _{CC} = 24 V, Output Off
V _{OL}	Output Saturation Voltage		100	400	mV	V _{CC} = 4.5 V, I _{OL} = 20 mA, Slot Open
I _{OL}	Output Leakage Current		0.1	10.0	μA	V _{CC} = 4.5 V, V _{OUT} = 24 V, Slot Blocked ⁽¹⁾
t _r	Output Rise Time		0.21	1.00	μs	R _L = 820 Ω, C _L = 20 pF
t _f	Output Fall Time		0.25	1.00	μs	

(1) Slot blocked with a ferrous material to interrupt magnetic flux.

Typical Performance Curves

