



1074 Kenran Industrial Dr.
St. Louis, MO 63137
Phone: 1-800-381-9968

HUMCO SHAFT ACCESSORIES

Duramax Johnson Cutless® Rudder Bushings

Rudder Bushings

DX490

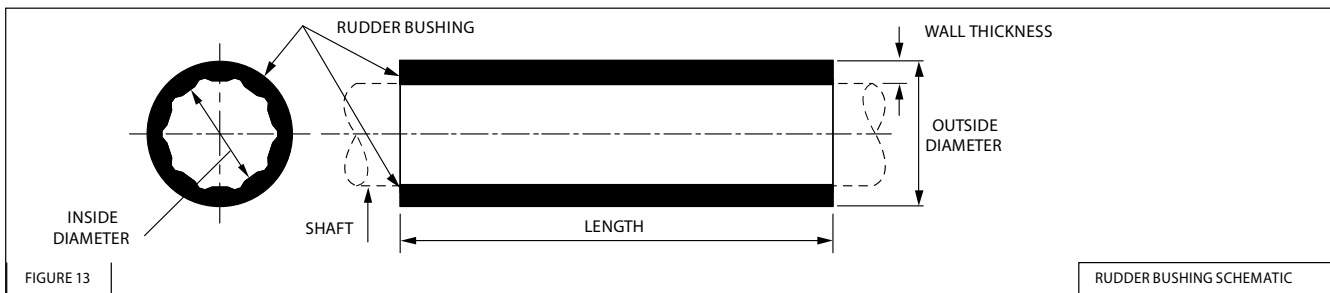


DX490 Rudder Bushings are molded from a 70 Scale D, Durometer, Nitrile Rubber Compound, formulated to withstand the rugged "impact" service encountered in ship's rudder steering systems. They possess high rigidity for maximum dimensional stability while still retaining a degree of resiliency required to dampen peak shock loads.

DX490 Rudder Bushings are homogenous cylinders molded with longitudinal lubrication grooves. Grease, oil and water serve equally well as lubricants. The DX490 Rudder Bushing is resistant to deterioration by hydrocarbons, acids, salt water corrosion and electrolysis.

CAUTION: **DX490** Rudder Bushings are supplied with molded I.D. and O.D. dimensions which allow ample material for finish machining. However, when finish boring I.D. dimensions do not remove more than 70% of the lubricant groove depth.

IMPORTANT: In addition to interference press fit, **DX490** Rudder Bushings must be mechanically secured with set screws or other locking devices to prevent movement during operation and the expected operating temperature range.



Part Number	Code	Inside Diameter Dimensions		Outside Diameter Dimensions		Length Dimensions		ID Across Water Grooves Dimensions		Weight	
		inches	mm	inches	mm	inches	mm	inches	mm	lb.	kg.
812100038	DX 150	1.45	36.83	2.35	59.69	11	279.40	1.62	41.15	1.0	0.5
812100044	DX 175	1.70	43.18	2.59	65.79	13	330.20	1.97	50.04	1.5	0.7
812100051	DX 200	1.95	49.53	3.07	77.98	15	381.00	2.20	55.88	2.5	1.1
812100057	DX 225	2.18	55.37	3.32	84.33	7 1/2	190.50	2.57	65.28	2.3	1.0
812100064	DX 250	2.44	61.98	3.68	93.47	9	228.60	2.75	69.85	2.7	1.2
812100070	DX 275	2.70	68.58	3.92	99.57	10	254.00	2.97	75.44	3.0	1.4
812100076	DX 300	2.95	74.93	4.20	106.68	11	279.40	3.39	86.11	4.0	1.8
812100083	DX 325	3.19	81.03	4.42	112.27	12	304.80	3.60	91.44	4.0	1.8
812100089	DX 350	3.34	84.84	5.19	131.83	13	330.20	3.76	95.50	7.5	3.4
812100095	DX 375	3.66	92.96	5.18	131.57	14	355.60	4.05	102.87	6.5	2.9
812100102	DX 400	3.93	99.82	5.45	138.43	15	381.00	4.28	108.71	7.5	3.4
812100108	DX 425	4.16	105.66	5.68	144.27	16	406.40	4.55	115.57	9.0	4.1
812100114	DX 450	4.42	112.27	6.02	152.91	17	431.80	4.68	118.87	11.0	5.0
812100121	DX 475	4.65	118.11	6.01	152.65	18	457.20	5.05	128.27	10.0	4.5
812100127	DX 500	4.93	125.22	6.68	169.67	19	482.60	5.31	134.87	15.0	6.8
812100135	DX 525	5.15	130.81	6.90	175.26	20 1/2	520.70	5.64	143.26	17.0	7.7
812100140	DX 550	5.39	136.91	7.61	193.29	21	533.40	5.91	150.11	21.0	9.5
812100146	DX 575	5.65	143.51	7.65	194.31	22	558.80	6.00	152.40	22.0	10.0
812100152	DX 600	5.87	149.10	8.65	219.71	22	558.80	6.40	162.56	24.0	10.9
812100165	DX 650	6.36	161.54	8.67	220.22	22	558.80	6.84	173.74	27.8	12.6
812100171	DX 675	6.65	168.91	9.00	228.60	23	584.20	7.16	181.86	31.0	14.1
812100178	DX 700	6.88	174.75	9.08	230.63	24 1/2	622.30	7.35	186.69	31.0	14.1
812100184	DX 725	7.10	180.34	10.47	265.94	27 1/2	698.50	7.60	193.04	38.0	17.2
812100191	DX 750	7.33	186.18	10.47	265.94	27 1/2	698.50	8.07	204.98	35.0	15.9
812100197	DX 775	7.70	195.58	10.47	265.94	27 1/2	698.50	8.30	210.82	45.0	20.4
812100203	DX 800	7.82	198.63	10.56	268.22	29 1/2	749.30	8.50	215.90	50.0	22.7
812100216	DX 850	8.37	212.60	12.20	309.88	35	889.00	9.09	230.89	65.0	29.5
812100222	DX 875	8.64	219.46	11.32	287.53	32 1/2	825.50	9.11	231.39	58.0	26.3
812100229	DX 900	8.89	225.81	11.32	287.53	32 1/2	825.50	9.49	241.05	73.0	33.1
812100235	DX 925	9.11	231.39	12.22	310.39	35	889.00	9.72	246.89	85.0	38.6

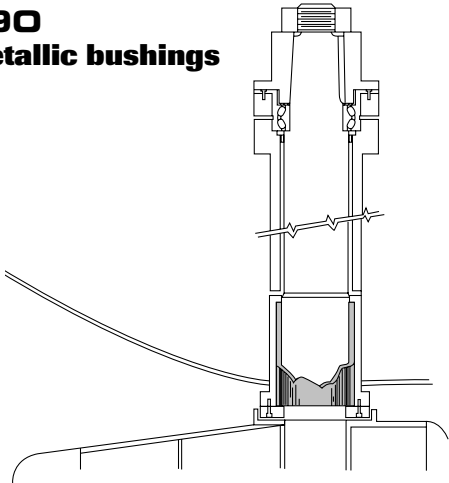


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HUMCO SHAFT ACCESSORIES

Duramax Johnson Cutless® Rudder Bushings

DX490
non-metallic bushings



DX490
PRODUCT SPECIFICATIONS

PHYSICAL PROPERTIES:

Deformation	Load PSI	Deflection	Temperature	
	225	.004"	72° F	
	300	.0045"	72° F	
Compressive Strength	15,000	Elastic Limit	72° F	
Tensile	3000 PSI			
Expansion and Contraction	Configuration	Contraction	Temp.	Recovery
	Std. Tubular	.002" -.0025" per inch of OD	-20° F	100%
Absorption	Aging	Liquid	Temp.	Vol. Change %
	70 hrs.	ASTM #3 Oil	212° F	+ 4.9%
	70 hrs.	ASTM #3 Oil	100° F	+ less than 1%
	70 hrs.	ASTM #3 Oil	72° F	Negligible
	70 hrs.	H ₂ O	212° F	+ 2.6%
	70 hrs.	H ₂ O	100° F	Negligible

Range of working temperature - -20° to 180° continuous service.

DX490 PRODUCT SPECIFICATIONS

CALCULATING THE FINISHED (MACHINED) SIZE OF DX490

Nominal Bushing I.D. and O.D. dimensions must be adjusted to allow for proper shaft to bearing running clearance, thermal expansion and contraction and interference press fit. Before machining, calculate the finished machined bearing I.D. and O.D. dimensions as follows:

EXAMPLE:

Nominal Shaft Diameter: 8 inches
Nominal Bearing Housing Diameter: 12 inches

To determine the finished machined bearing I.D. dimension

refer to the machining tables and add the running clearance (Table X), thermal factor (Table Y) and press fit allowance (Table Z), to the nominal shaft diameter.

Finished Machined Bearing I.D. Dimension equals:

- + Nominal Bearing Shaft Diameter 8.000
 - + Running Clearance (Table X) 0.018
 - + Thermal Factor (Table Y) 0.016
 - + Press Fit Allowance (Table Z) 0.008
- 8.042 inches I.D.

To determine the finished machined bearing O.D. dimension

refer to the machining tables and add the thermal factor (Table Y) and the press fit allowance (Table Z), to the nominal bearing housing diameter.

Finished Machined Bearing O.D. Dimension equals:

- + Nominal Bearing Housing Diameter 12.000
 - + Thermal Factor (Table Y) 0.016
 - + Press Fit Allowance (Table Z) 0.008
- 12.024 inches O.D.

TABLE X – RUNNING CLEARANCE

Nominal ID inches	2	3	4	5	6	7	8	9	10	11	12	13	14
Allowance inches	0.012	0.013	0.014	0.015	0.016	0.017	0.018	0.019	0.020	0.021	0.022	0.023	0.024
Nominal ID mm	50.80	76.20	101.60	127.00	152.40	177.80	203.20	228.60	254.00	279.40	304.80	330.20	355.60
Allowance mm	0.30	0.33	0.36	0.38	0.41	0.43	0.46	0.48	0.51	0.53	0.56	0.58	0.61

TABLE Y – THERMAL FACTOR

Nominal ID inches	2	3	4	5	6	7	8	9	10	11	12	13	14
Allowance inches	0.004	0.006	0.008	0.010	0.012	0.014	0.016	0.018	0.020	0.022	0.024	0.026	0.028
Nominal ID mm	50.80	76.20	101.60	127.00	152.00	177.80	203.20	228.60	254.00	279.40	304.80	330.20	355.60
Allowance mm	0.10	0.15	0.20	0.25	0.30	0.35	0.41	0.46	0.51	0.56	0.61	0.66	0.71

TABLE Z – PRESS FIT ALLOWANCE

Nominal ID inches	2	3	4	5	6	7	8	9	10	11	12	13	14
Allowance inches	0.005	0.005	0.005	0.005	0.005	0.008	0.008	0.008	0.008	0.010	0.010	0.010	0.010
Nominal ID mm	50.80	76.20	101.60	127.00	152.00	177.80	203.20	228.60	254.00	279.40	304.80	330.20	355.60
Allowance mm	0.13	0.13	0.13	0.13	0.13	0.20	0.20	0.20	0.20	0.25	0.25	0.25	0.25



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Duramax Johnson Cutless® Bearing Tolerances

Bearing Tolerances

The following are the standards as established by the U.S. Navy, according to BuShips plan number 810-1385664, dated 14 January 1963 "Bearing Stern Tube and Strut":

Shaft or Sleeve Size		
3/4"	thru	1 3/8"
1 7/16"	thru	1 7/8"
2"	thru	2 3/8"
2 1/2"	thru	3"
3 1/8"	thru	3 3/4"
3 7/8"	thru	4 1/4"
4 3/8"	thru	4 7/8"
5"	thru	5 3/8"
5 1/2"	thru	5 7/8"
6"	thru	6 3/8"
6 1/2"	thru	6 7/8"
7"	thru	7 3/8"
7 1/2"	thru	7 7/8"
8"	thru	8 3/8"
8 1/2"	thru	8 7/8"
9"	thru	9 7/8"
10"	thru	10 7/8"
11"	thru	11 3/8"
11 1/2"	thru	12 3/4"
12 7/8"	thru	13 3/8"
13 1/2"	thru	14 1/2"
14 5/8"	thru	15"

Shaft Clearance	
+ 0.003	to + 0.008
+ 0.004	to + 0.010
+ 0.006	to + 0.012
+ 0.007	to + 0.014
+ 0.008	to + 0.015
+ 0.010	to + 0.017
+ 0.012	to + 0.019
+ 0.015	to + 0.023
+ 0.017	to + 0.025
+ 0.020	to + 0.029
+ 0.022	to + 0.032
+ 0.024	to + 0.034
+ 0.025	to + 0.035
+ 0.027	to + 0.037
+ 0.028	to + 0.040
+ 0.030	to + 0.042
+ 0.032	to + 0.044
+ 0.034	to + 0.048
+ 0.035	to + 0.050
+ 0.037	to + 0.052
+ 0.040	to + 0.055
+ 0.042	to + 0.058

O.D. Tolerance			
1 1/4"	thru	2"	+ .001 to - .001
2"	thru	6"	+ .002 to - .001
6"	thru	7 1/2"	+ .002 to - .002
7 3/4"	thru	12"	+ .005 to - .005
12"	thru	16"	+ .006 to - .006
16"	thru	18"	+ .008 to - .008

Bearing and Journal Wear

All bearings and journals experience wear in service and especially those located adjacent to the ship's propeller. New bearings properly fitted to the shaft journal wear more slowly when run in clean water. Where the lubricant water is more heavily contaminated with entrained abrasives the wearing is more rapid. Bearings thus exposed should be inspected at least annually, or during each haul out to determine actual wear. For optimum vessel service a program of good bearing maintenance combined with timely replacement or relining of worn bearings is a must.

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