



# PNEUMATIC ACTUATOR

## RACK AND PINION

**SERIES 90/91**

Double Acting & Spring Return

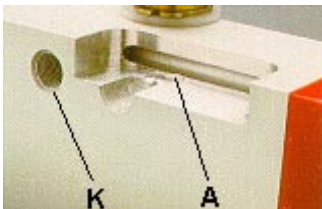
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# SERIES 90/91

Styling, strength, compactness, and simplicity of design have been combined to produce the best rotary actuator on the market today. Bray Controls is proud to expand this successful line of high performance, highest quality pneumatic actuators, the Series 90/91. We have developed through engineering excellence and precision manufacturing a space saving, modular product line. Many features previously available only as options are built into the Bray Series 90/91. This results in reduced overall

The Bray space-saving modular product line is completely enclosed and self contained. The many features of the engineered design minimize maintenance and provide safe, simple disassembly and assembly. The INTEGRAL PORTING (A) reduces the cost of external tubing that is also easily damaged. Offered for the first time to the industry are the unique, lubricated ACETAL PISTON GUIDES (B) and RINGS (C). The acetal piston guides and rings have a very low coefficient of friction and absorb the side thrusts of the pistons. In addition, the piston cylinder walls in the body are honed to a very fine finish thus reducing the overall coefficient of friction. These features extend the life of the actuator and make the Series 90/91 one of the most efficient actuators on the market. The OUTPUT SHAFT BEARINGS (D) on the top and bottom of the pinion are made of low-friction acetal. The OUTPUT SHAFT and PINION

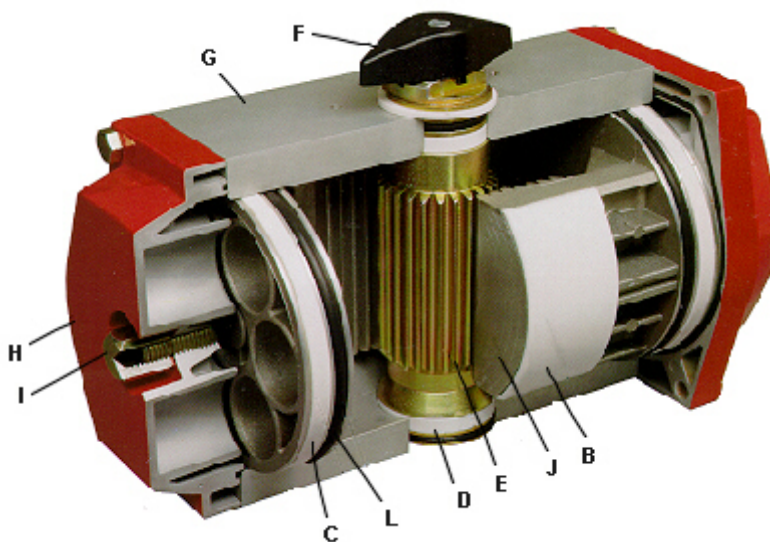


size requirements and economic savings. In addition the Brayline Accessories are fully modular and directly mount to the actuator - providing flexibility and efficiency at reduced cost. Bray Series 90/91 actuators are rack and pinion, opposed-piston actuators available in two versions: double acting for rotation of 90°, 135° and 180°, and spring return for 90° rotation. Their ideal use is actuating butterfly, ball or plug valves, but they can be applied anywhere a rotation of 90°, 135° or 180° is needed. Rotated on low friction acetal bearings, Bray units are well suited to handle offset loads to the gear and

GEAR (E) are one-piece, manufactured from hardened alloy steel and zinc-plated for corrosion protection. The SHAFT POSITION INDICATOR (F) clearly shows open or closed position and is easily removable for MANUAL OVERRIDE FUNCTION of the actuator when required. The BODY (G) is extruded aluminum with anodized corrosion protective coating. The END CAPS (H) are epoxy coated for chemical resistance. The coating is generally resistant to dilute aqueous acids, salts, aliphatic hydrocarbons, detergents, petroleum solvents, alcohols, greases and oils.

output shaft assembly. Bray Series 90/91 actuators were designed primarily for pneumatic operation up to a maximum pressure of 140 psig (10 Bar) and for temperature ranges of 40°F (-40°) to +200°F (+95°). For higher and lower temperature applications, consult factory. All double acting and spring return units are suitable for both on-off and throttling applications. Actuators which can be actuated with other media such as hydraulic oil or water are also available as an option. Please consult Bray factory for further information.

The TRAVEL STOP (I) adjusting screws limit the travel of the actuator to specific degrees of rotation. The PISTONS (J) are die-cast aluminum. The two PNEUMATIC SUPPLY PORTS (K) are 1/8" NPT ports. NAMUR interface is available on all actuator sizes. All Bray Series 90/91 actuators have permanently lubricated factory packed bearings and guides. No further lubrication is necessary under normal operating conditions. All seals, including PISTON SEALS (L), are permanently lubricated Buna-N O-rings.



## ACTUATOR DIMENSIONS

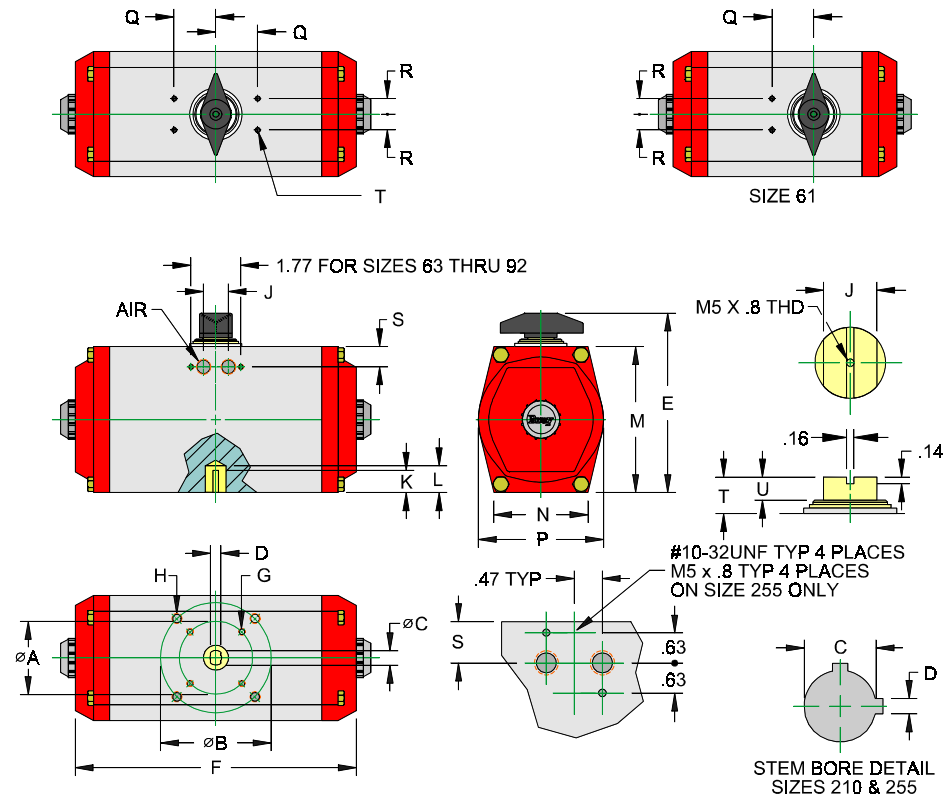
SIZE	61*	63	83	92	118	127	160	210	255**
AIR NPT	1/8	1/8	1/8	1/8	1/4	1/4	1/4	1/4	1/4
A ISO "F"¥	1.97 F05	1.97 F05	1.97 F05	1.97 F05	2.76 F07	2.76 F07	-	4.92 F12	6.50 F16
B ISO "F"¥	-	2.76 F07	2.76 F07	2.76 F07	4.92 F12	4.92 F12	4.92 F12	6.50 F16	7.87x4.72 Rect.
C	.55	.55	.75	.75	1.18	1.18	1.18	1.97	2.50
D	.40	.40	.51	.51	.87	.87	.87	.47	.62
E	4.29	4.29	5.20	5.54	6.93	7.73	9.37	11.61	13.46
F	4.32	5.24	7.01	8.03	11.22	11.46	14.57	17.80	26.70
G (UNC)	1/4-20 x 5/16	1/4-20 x 5/16	1/4-20 x 5/16	1/4-20 x 5/16	5/16-18 x 3/8	5/16-18 x 3/8	-	1/2-13 x 9/16	5/8-11 x 3/4
H (UNC)	-	5/16-18 x 3/8	5/16-18 x 3/8	5/16-18 x 3/8	1/2-13 x 9/16	1/2-13 x 9/16	1/2-13 x 9/16	5/8-11 x 3/4	5/8-11 x 3/4
J	.87	.87	.87	.87	.94	.94	.94	.94	.94
K	-	-	-	-	-	-	-	2.76	4.25
L	1.38	1.38	1.38	1.38	2.11	2.11	2.11	4.72	6.75
M	3.46	3.46	4.27	4.61	5.52	6.32	7.80	10.04	11.89
N	2.36	2.36	2.57	2.76	4.15	4.07	4.33	5.32	6.30
P	2.76	2.76	3.58	3.94	4.72	5.39	6.77	8.83	10.75
Q	1.58	3.15	3.15	3.15	3.15	3.15	5.12	5.12	5.12
R	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18
S	.57	.57	.58	.56	.76	.84	.84	1.04	1.06
T (UNF)	No.10-32 x 1/4	No.10-32 x 1/4	No.10-32 x 1/4	No.10-32 x 1/4	No.10-32 x 1/4	No.10-32 x 1/4	No.10-32 x 1/4	No.10-32 x 1/4	No.10-32 x 1/4

### NOTES:

¥ ISO "F" means mounting flange-drilling pattern.

\* Series 90-61 has only one piston.

\*\* Sizes for Series 90-255A in table. The 90-255B actuator has a C dimension of 3.00 and D dimension of .75.



### ACTUATOR SPEEDS

SIZE	61	63	83	92	118	127	160	210	255
Open Stroke/ Close Stroke	1/4	1/4	1/4	1/4	1/2	1/2	1	2	2 3/4

Times are in seconds, at 80 PSIG with 6ft. Tubing, internal diameter approximately 1/4".

### ACTUATOR WEIGHTS

SIZE	61	63	83	92	118	127	160	210	255
Series 90	2.5	3.0	5.5	7.3	15.5	19.0	35.0	65.0	144.0
Series 91	2.8	3.6	7.1	9.5	19.9	25.2	49.2	95.3	192.6

Weights are in lbs. Series 91 weights are with full set of 6 springs per piston.

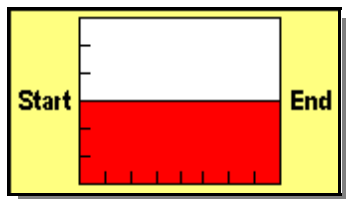
### ACTUATOR VOLUMES (ins<sup>3</sup>) PISTON DISPLACEMENT

SIZE	61	63	83	92	118	127	160	210	255
Counter-clockwise	8.34	9.35	20.5	28.9	62.0	74.2	140.6	309.5	734.1
Clockwise	5.14	5.98	13.6	20.4	47.2	58.3	115.4	239.1	574.0

Volume of air in cubic inches required for 90° operation.

### DOUBLE ACTING TORQUE CURVE

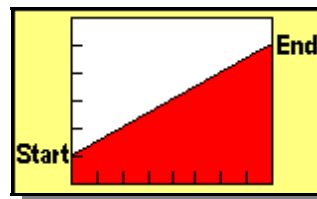
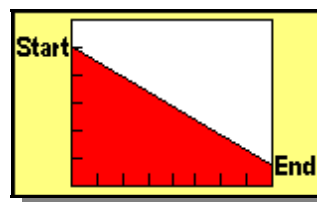
Series 90 – (Air to Air)



The Series 90 Actuator has a constant output torque throughout travel from start to end, clockwise or counterclockwise rotation.

### SINGLE ACTING TORQUE CURVE

Series 91 – (Spring Return)



The Series 90 Actuator has a constant output torque throughout travel from start to end, clockwise or counterclockwise rotation.

### SERIES 90 ACTUATOR TORQUE DATA

Double Acting Pneumatic Operated Torque Output (Lb.-Ins.)

Actuator Size	Air Supply Pressure (PSIG)				
	40	60	80	100	120
61	72	110	148	186	224
63	145	221	297	373	449
83	351	536	721	906	1091
92	493	753	1013	1272	1532
118	1058	1615	2171	2728	3285
127	1410	2152	2894	3636	4378
160	2797	4270	5742	7214	8687
210	5783	8826	11870	14914	17957
255	14211	21691	29171	36650	44130

### SERIES 91 ACTUATOR TORQUE DATA

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**SERIES 91 ACTUATOR TORQUE DATA** Air Operated, With Spring Return, Torque Output (Lb.-Ins.)

Actuator Size	No. Springs Per Piston	Air Supply Pressure (PSIG)											
		40		60		80		100		120		Spring Stroke	
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
61*	2	45	32	83	70	121	108	159	146	197	184	40	27
	3	31	13	69	51	107	89	145	127	183	165	59	41
	4			56	32	94	70	132	108	170	146	78	54
	5			42	13	80	51	118	89	156	127	97	68
	6					67	32	105	70	143	108	116	81
63	2	91	65	167	141	243	217	319	293	395	369	80	54
	3	64	27	140	103	216	179	292	255	368	331	118	81
	4			113	65	189	141	265	217	341	293	156	108
	5			86	27	162	103	238	179	314	255	194	135
	6					135	65	211	141	287	217	232	162
83	2	210	167	395	352	580	537	765	722	950	907	184	141
	3	156	76	341	261	526	446	711	631	896	816	275	195
	4			281	176	466	361	651	546	836	731	360	255
	5			220	97	405	282	590	467	775	652	439	316
	6					369	185	554	370	739	555	536	352
92	2	310	232	570	492	830	752	1089	1011	1349	1271	261	183
	3	218	101	478	361	738	621	997	880	1257	1140	392	275
	4			386	231	646	491	905	750	1165	1010	522	367
	5			294	94	554	354	813	613	1073	873	659	459
	6					462	229	721	488	981	748	784	551
118	2	692	469	1249	1026	1805	1582	2362	2139	2919	2696	589	366
	3	509	174	1066	731	1622	1287	2179	1844	2736	2401	884	549
	4			883	437	1439	993	1996	1550	2553	2107	1178	732
	5			700	142	1256	698	1813	1255	2370	1812	1473	915
	6					1073	404	1630	961	2187	1518	1767	1098
127	2	880	465	1622	1207	2364	1949	3106	2691	3848	3433	945	530
	3			1357	733	2099	1475	2841	2217	3583	2959	1419	795
	4			1094	261	1836	1003	2578	1745	3320	2487	1891	1058
	5					1568	529	2310	1271	3052	2013	2365	1326
	6					1302	57	2044	799	2786	1541	2837	1592
160	2	1819	1118	3292	2591	4764	4063	6236	5535	7709	7008	1679	978
	3	1399	349	2872	1822	4344	3294	5816	4766	7289	6239	2448	1398
	4			2452	1123	3924	2595	5396	4067	6869	5540	3147	1818
	5			2030	353	3502	1825	4974	3297	6447	4770	3917	2240
	6					3154	1196	4626	2668	6099	4141	4546	2588
210	2	3833	2508	6876	5551	9920	8595	12964	11639	16007	14682	3275	1950
	3	2859	868	5902	3911	8946	6955	11990	9999	15033	13042	4915	2924
	4			4930	2275	7974	5319	11018	8363	14061	11406	6551	3896
	5			3949	638	6993	3682	10037	6726	13080	9769	8188	4877
	6					6022	2031	9066	5075	12109	8118	9839	5848
255	2	9487	6747	16967	14227	24447	21707	31926	29186	39406	36666	7464	4724
	3	7125	3015	14605	10495	22085	17975	29564	25454	37044	32934	11196	7086
	4			12243	6762	19723	14242	27202	21721	34682	29201	14929	9448
	5			9880	3030	17360	10510	24839	17989	32319	25469	18661	11811
	6					14998	6778	22477	14257	29957	21737	22393	14173

\*Size 61 has only one piston

# SPECIFICATIONS

## SPACE SAVING MODULAR PRODUCT LINE

The actuator shall be pneumatically operated and must travel a minimum of 90 degrees in each direction and must be able to over travel at 3% in each direction past 90 degrees. The actuator shall be totally enclosed and contained in a single enclosure, with no external moving parts. All pneumatic passage ways must be integral to the actuator housing so as to eliminate the need for external tubing. Actuator shall be rack and pinion design, and the output torque shall be linear throughout travel. Actuator shall be provided with pistons that have acetal piston guides and rings thus greatly extending the life of the actuator and reducing friction to the minimum. Actuator must be supplied with end of travel adjustments integral with the actuator end caps. The actuator shall be provided with mechanical visual

position indicator, and the indicator must be able to be removed easily thus exposing the output shaft for use of manually overriding the actuator when needed. The output shaft and pinion must be of one piece and must be manufactured out of hardened alloy steel and zinc plated for corrosion protection. Actuator shall be able to mount in any position without loss of performance. The actuator shall bolt directly to Bray valve mounting flange without the need for any brackets. Actuator housing shall be anodized aluminum and all external fasteners shall be carbon steel, zinc plated. Springs shall be spring steel, coated for corrosion protection. All seals shall be Buna-N and bearings made of acetal resin.

The actuator shall be factory lubricated. Actuator design must have smooth housing lines so it will self-drain. The actuator shall be factory tested to ensure proper operation.

## SPRING RETURN MODULAR DESIGN

The Spring Return System for fail-safe services must be installed in the same housing as the double acting actuator, with no additional housing extensions required, therefore saving weight and space. The spring system must be supplied as a self-contained spring cartridge system. This is a safety feature that ensures disassembly of the actuator without danger of spring release when end caps are removed. Actuator shall be Bray Series 90 or 91 or approved equal.

## OPTIONAL EQUIPMENT

See Bray brochure #1010 for Solenoid,

brochure #1011 for Pneumatic and Electro-Pneumatic Positioners and brochure #1012 for Valve Status Monitors.

## SERVICE DATA:

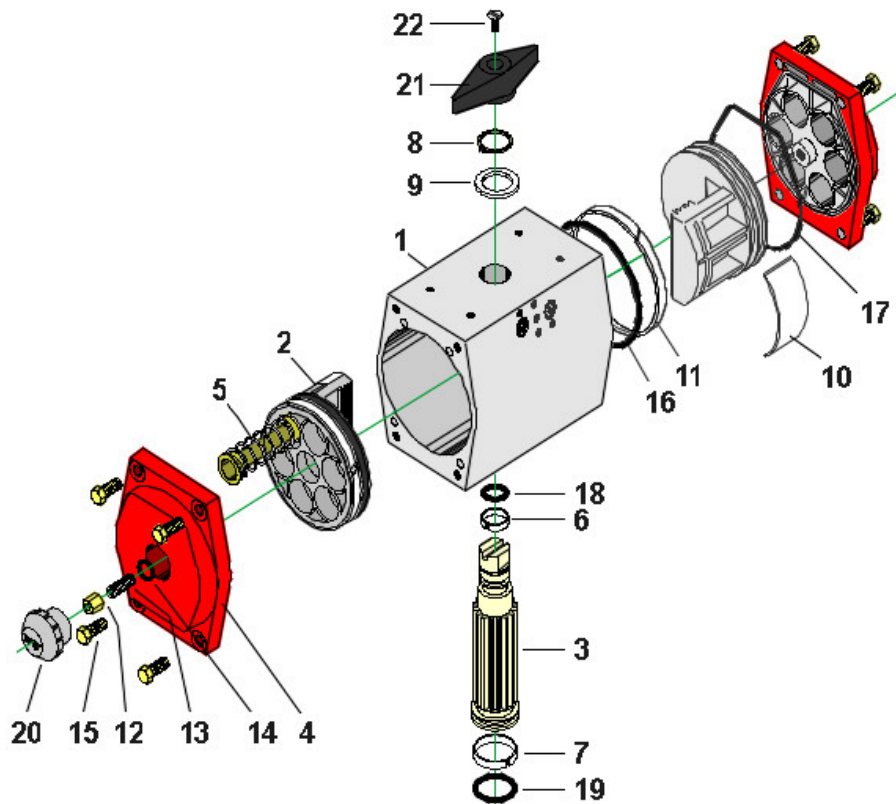
Actuators shall be designed for pneumatic operation up to a maximum pressure of 140 PSIG (10 Bar) and for temperature ranges of -40°F (-40°C) to +200°F (+95°C). Filtered air is recommended but not required. All double acting and spring return units shall be suitable for both on-off and throttling applications. Optional units shall be able to operate with other media such as hydraulic oil or water, consult factory for further information.

## STANDARD MATERIALS:

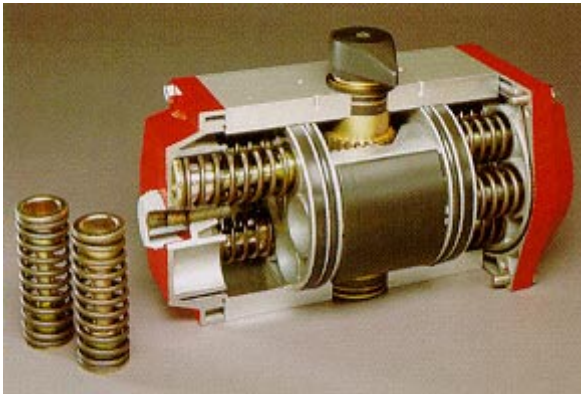
- Body: Extruded aluminum alloy, anodized
- End Caps: Die cast aluminum alloy with corrosion resistant epoxy coating
- Pistons: Die cast aluminum alloy
- Output Shaft/ Pinion: Carbon steel, zinc plated (yellow)
- Shaft Bearing: Acetal
- Piston Guide: Acetal
- Fasteners: Stainless Steel
- Springs: Spring steel, protective coating
- O-Ring Seals: Buna-N
- Options: Epoxy coated body exterior  
Electroless Nickel plated body exterior  
Hard Anodized body exterior  
Stainless steel pinion

## ACTUATOR COMPONENTS

Item No	Qty.	Description
1	1	Body
2	2	Piston
3	1	Pinion
4	2	End Cap
5	12 max	Spring Cartridge Assembly
6	1	Upper Bearing
7	1	Lower Bearing
8	1	Retaining Ring
9	1	Nylon Washer
10	2	Acetal-Bearing Pad
11	2	Acetal-Guide Ring
12	2	Stop Nut
13	2	Travel Adjusting Screw Stop
14	2	O-Ring Travel Stop
15	8	Hex Head Cap Screw
16	2	O-Ring – Piston
17	2	O-Ring – End Cap
18	1	O-Ring – Shaft, Top
19	1	O-Ring – Shaft, Bottom
20	2	Dust Cap
21	1	Indicator Pointer
22	1	Indicator Pointer Screw



# FEATURES



## SPRING RETURN

Bray's Series 91 spring return models employ a unique cartridges offer our customers safety, simplicity and reduced space requirements. The unit's primary design advantages are:

- 1) The actuator was designed to save both space and cost. The housing length of the spring return unit is the same as the double acting unit. Converting from double acting to spring return actuation is just a matter of removing the end caps and adding the unique spring cartridges.
- 2) The spring cartridges provide for complete safety of handling. The actuator can be disassembled and assembled without cumbersome equipment or danger to the installer due to springs releasing.
- 3) The standard spring cartridge system is available for 40, 60, 80 and 100 psi services. For other psi requirements, consult factory.

## TRAVEL STOP

The travel stop adjustment is a built-in feature of the Bray product line. Adjusting screws are located in both end caps to precisely adjust the travel of the actuator to specific degrees of rotation. The travel stop permits field readjusting of actuator movement to open or closed positions.

## DIRECT MOUNTING TO BRAY VALVES

Bray actuators comply with ISO 5211 and VDI/VDE 3845 (NAMUR recommendations) dimensions and mount directly to Bray valves without using external linkages. Field installation is simple, misalignment is minimized and contamination buildup between valve and actuator is reduced. Bray can provide linkage for mounting actuators to other devices requiring 90° to 180° rotation.



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# **Bray** CONTROLS

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