
SERIES 92/93

PNEUMATIC RACK AND PINION ACTUATORS

TECHNICAL SALES MANUAL



Bray[®]

BRAY.COM

THE HIGH PERFORMANCE COMPANY

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TECHNICAL DATA

STANDARD MATERIALS SELECTION

Body	Extruded Aluminum Alloy, Anodized 316 Stainless Steel
End Caps	Die cast Aluminum Alloy with Corrosion Resistant Polyester Coating 316 Stainless Steel
Pistons	Die Cast Aluminum Alloy
Output Shaft/Pinion	Carbon Steel, Zinc Plated
Travel Stop	Alloy Steel
Shaft Bearings	Acetal
Piston Guides	Acetal
Fasteners	Stainless Steel
Springs	Spring Steel, Protective Coating
Piston O-Ring Seals	Buna-N
Options	Polyester Coated Body Exterior Electroless Nickel Plated Body Exterior Hard Anodized Body Exterior Seacorr Coated Body Exterior Stainless Steel Pinion

OPERATING CONDITIONS

Pressure Range	40 - 140 psi (2.8 - 10 bar)
Media	Dry Compressed Air/Inert Gas* *Contact Factory for other media.
Temperature Range	Standard -20° F to 200° F (-29° C to 93° C)
	Low -40° F to 176° F (-40° to 80° C)
	High 0° F to 300° F (-18° C to 149° C)
Note: Cycle life on Low and High temperature seal kits reduced compared to Standard Buna N Seals	
Series 92 Double Acting	Available in 90°, 135°, 180° Rotation
Series 93 Spring Return	Available in 90° Rotation Operating Pressure 140 psig (10 bar) maximum

COMPLIANCES

Torque Base	Mounting Dimensions as per ISO 5211: 2001(E)
Accessories	Shaft Driven Accessories Mounting per NAMUR-VDE
Ingress Protection	IP66/IP67M per IEC 60529
Safety	ATEX, SIL 3 suitable, PED

INSTALLATION NOTES

These notes apply to the installation of Bray S92/93 pneumatic valve actuators.

- > Verify that the valve and the actuator are both in the same position (both open or both closed) before mounting the actuator to the valve.
- > Apply a light coating of grease to the inside of the actuator output bore before installing the actuator on the valve. This will allow the actuator to be more easily removed from the valve stem even after years of service.
- > If stem adapters are required to match the actuator output bore to the valve stem, apply a light coating of grease to the inside of the stem adapter as well as the inside of the actuator output bore.
- > Some stem adapters are kits consisting of multiple components. These kits may contain spacers that look like stem adapters, but are designed to keep the stem adapter in place during operation of the actuator. Verify that all stem adapters and spacers are installed in the proper position and sequence.
- > If keyed stem adapters are used, the key must be held in the keyway so that it will not work loose during operation of the actuator. The key may be retained by any one of several methods:
- > If the valve stem height matches the depth of the actuator output bore, use a key that fits the full length of the keyway. Tack weld the key to the adapter before installation in the actuator.
- > Upset the end of the keyway after the key has been installed in the shaft by using a punch or chisel.
- > If mounting studs are used instead of bolts, thread the studs completely into the actuator before placing the actuator on the valve. This assures that the full strength of the connection is achieved.
- > While the mounting bolts are only finger tight, cycle the actuator fully open and fully closed to verify proper alignment on the valve.
- > Tighten the mounting bolts or nuts in a diagonal pattern to evenly distribute stress in the bolts.

ACTUATOR MOUNTING CODES FOR S92/93 - IMPERIAL (Inch)

Actuator Sizes	Valve Code	Inner Bolt Circle			Outer Bolt Circle			Stem Hole			
		Bolt Circle (+/- .005)	No. Holes	Bolt Size	Bolt Circle (+/- .005)	No. Holes	Bolt Size	Bore Diameter (+/- .004)	Across Flats (+ .002-.0)	Depth	Keyway Width (+ .002-.0)
48	AA	1.42	4	#10-32	1.97	4	1/4-20	0.4	0.32	1.3	NA
63	A	1.969	4	1/4-20	2.756	4	5/16-18	0.552	0.395	1.38	NA
83	C	1.969	4	1/4-20	2.756	4	5/16-18	0.749	0.513	1.46	NA
93	C	1.969	4	1/4-20	2.756	4	5/16-18	0.749	0.513	1.46	NA
119	E	2.756	4	5/16-18	4.921	4	1/2-13	1.182	0.867	2.2	NA
128	E	2.756	4	5/16-18	4.921	4	1/2-13	1.182	0.867	2.2	NA
160A	E	NA	NA	NA	4.921	4	1/2-13	1.182	0.867	2.2	NA
160B	F	NA	NA	NA	4.921	4	1/2-13	1.38	NA	2.38	0.394
210	G	4.921	4	1/2-13	6.496	4	5/8-11	1.97	NA	2.76	0.472
255A	H	6.496	4	M20 x 2.5P	4.724 X 7.874	4	M20 x 2.5P	2.505	NA	4.25	0.625
255B	K	6.496	4	M20 x 2.5P	4.724 X 7.874	4	M20 x 2.5P	3.006	NA	4.25	0.750

ACTUATOR MOUNTING CODES FOR S92/93 - METRIC (mm)

Actuator Sizes	Valve Code	Inner Bolt Circle			Outer Bolt Circle			Stem Hole			
		Bolt Circle (+/- .127)	No. Holes	Bolt Size	Bolt Circle (+/- .127)	No. Holes	Bolt Size	Bore Dia. (+/- .102)	Across Flats (+ .050-.0)	Depth	Keyway Width
48	AA	36	4	M5 x 0.8P	50	4	M6 x 1.0P	10	8	33	NA
63	A	50	4	M6 x 1.0P	70	4	M8 x 1.25P	14	10	35	NA
83	C	50	4	M6 x 1.0P	70	4	M8 x 1.25P	19	13	37	NA
93	C	50	4	M6 x 1.0P	70	4	M8 x 1.25P	19	13	37	NA
119	E	70	4	M8 x 1.25P	125	4	M12 x 1.75P	30	22	56	NA
128	E	70	4	M8 x 1.25P	125	4	M12 x 1.75P	30	22	56	NA
160A	E	NA	NA	NA	125	4	M12 x 1.75P	30	22	56	NA
160B	F	NA	NA	NA	125	4	M12 x 1.75P	35	NA	60	10
210	G	125	4	M12 x 1.75P	165	4	M20 x 2.5P	50	NA	70	12
255A	H	165	4	M20 x 2.5P	120 x 200	4	M20 x 2.5P	64	NA	108	16
255B	K	165	4	M20 x 2.5P	120 x 200	4	M20 x 2.5P	76	NA	108	19

PNEUMATIC ACTUATOR DATA (Imperial)

Approximate Actuator Speeds (Seconds)									
Size	48	63	83	93	119	128	160	210	255
90° Travel	1/4	1/4	1/4	1/4	1/2	1/2	1	2	2 3/4

Note: Times shown are in seconds at 80 PSIG supply pressure with 6ft. tubing having an internal diameter of not less than approximately 1/4" using a Bray Series 62 or Series 63 solenoid. Bray S92/93 actuation times are very dependent on the flow capacity of their air supply. The use of smaller port solenoids, solenoid manifolds, smaller I.D. air supply tubing and/or extended lengths of tubing can significantly reduce the actuation time and/or initial response to the command signal.

Actuator Weights (lbs)									
Size	48	63	83	93	119	128	160	210	255
Double Acting	2	3.3	6.3	8.5	18	21.5	39	78	171
Spring Return	2.3	3.9	7.3	10.9	24.5	30.6	58.3	124.7	239

Weights are in lbs. Spring Return unit weights are with full set of springs on each piston.

Actuator Volumes (in ³)									
Size	48	63	83	93	119	128	160	210	255
Counter-Clockwise	5.7	9.6	24.8	39.0	81.0	106.5	187.5	360.0	750.0
Clockwise	4.8	13.4	32.6	50.1	102.7	140.6	259.6	450.0	900.0

Counter-clockwise: Air volume in cubic inches required to push pistons apart, full travel.

Clockwise: Air volume in cubic inches required to push pistons together, full travel.

PNEUMATIC ACTUATOR DATA (METRIC)

Approximate Actuator Speeds (Seconds)									
Size	48	63	83	93	119	128	160	210	255
90° Travel	1/4	1/4	1/4	1/4	1/2	1/2	1	2	2 3/4

Note: Times shown are in seconds at 5.5 bar supply pressure with 1.8 meter tubing having an internal diameter of not less than approximately (6.35 mm) using a Bray Series 62 or Series 63 solenoid. Bray S92/93 actuation times are very dependent on the flow capacity of their air supply. The use of smaller port solenoids, solenoid manifolds, smaller I.D. air supply tubing and/or extended lengths of tubing can significantly reduce the actuation time and/or initial response to the command signal.

Actuator Weights (kg)									
Size	48	63	83	93	119	128	160	210	255
Double Acting	0.9	1.5	2.9	3.9	8.2	9.8	17.7	35.4	77.6
Spring Return	1.0	1.8	3.3	4.9	11.1	13.9	26.4	56.6	108.4

Weights are in kg. Spring return unit weights are with full set of springs on each piston.

Actuator Volumes (cm ³)									
Size	48	63	83	93	119	128	160	210	255
Counter-Clockwise	93.4	157.3	406.4	638.6	1327.5	1744.5	3072.6	5899.3	12290.3
Clockwise	78.7	219.6	534.2	820.5	1683.1	2303.3	4254.1	7374.2	14748.4

Counter-clockwise: Air volume in cubic centimeters required to push pistons apart, full travel.

Clockwise: Air volume in cubic centimeters required to push pistons together, full travel.

SERIES 92 - TORQUE DATA

SERIES 92 ACTUATOR TORQUE DATA IMPERIAL (Lb-in)

Double Acting Pneumatic Operated, Torque Output

Actuator Size	Air Supply Pressure (PSIG)				
	40	60	80	100	120
48	75	113	150	188	225
63	145	221	297	373	449
83	351	536	721	906	1091
93	493	753	1013	1272	1532
119	1058	1615	2171	2728	3285
128	1410	2152	2894	3636	4378
160	2797	4270	5742	7214	8687
210	5783	8826	11870	14914	17957
255	14211	21691	29171	36650	44130

SERIES 92 ACTUATOR TORQUE DATA METRIC (N m)

Double Acting Pneumatic Operated, Torque Output

Actuator Size	Air Supply Pressure (Bar)				
	2.8	4.1	5.5	6.9	8.3
48	9	13	17	21	25
63	16	25	34	42	51
83	40	61	82	102	123
93	56	85	115	144	173
119	120	183	245	308	371
128	159	243	327	411	495
160	316	482	649	815	982
210	653	997	1341	1685	2029
255	1606	2451	3296	4141	4986

SERIES 93 ACTUATOR TORQUE DATA IMPERIAL (Lb-In)

Air Operated, With Spring Return, Torque Output

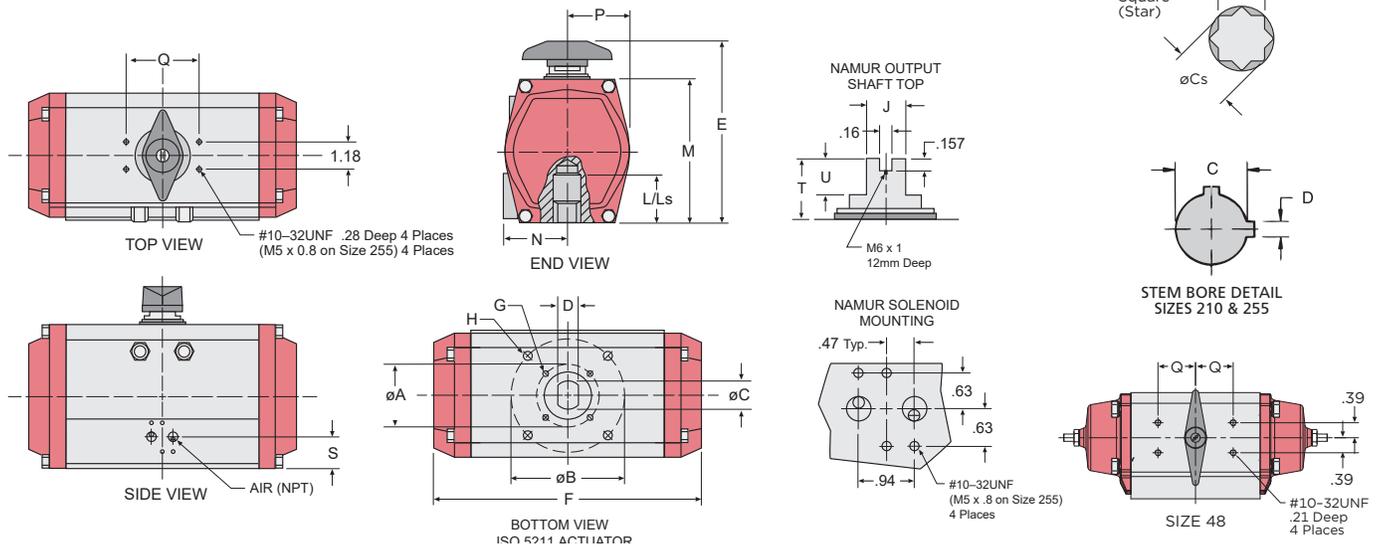
Actuator Size	No. Springs per Piston	Air Supply Pressure (PSIG)										Spring	
		40		60		80		100		120		Spring Start	Stroke End
		Start	End	Start	End	Start	End	Start	End	Start	End		
48	1	51	32	89	70	126	107	164	145	201	182	43	24
	2/1	39	10	77	48	114	85	152	123	189	160	65	36
	2			64	27	101	64	139	102	176	139	86	49
	3/2			52	5	89	42	127	80	164	117	108	61
	3					77	21	115	59	152	96	129	73
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
93	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
119	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
128	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

SERIES 93 ACTUATOR TORQUE DATA METRIC (N m)

Air Operated, With Spring Return, Torque Output

Actuator Size	No. Springs per Piston	Air Supply Pressure (Bar)										Spring	
		2.8		4.1		5.5		6.9		8.3		Spring Start	Stroke End
		Start	End	Start	End	Start	End	Start	End	Start	End		
48	1	6	4	10	8	14	12	19	16	23	21	5	3
	2/1	4	1	9	5	13	10	17	14	21	18	7	4
	2			7	3	11	7	16	12	20	16	10	6
	3/2			6	1	10	5	14	9	19	13	12	7
	3					9	2	13	7	17	11	15	8
63	2	10	7	19	16	28	25	36	33	45	42	9	6
	3	7	3	16	12	24	20	33	29	42	37	13	9
	4			13	7	21	16	30	25	39	33	18	12
	5			10	3	18	12	27	20	36	29	22	15
	6					15	7	24	16	32	25	26	18
83	2	24	19	45	40	66	61	86	82	107	103	21	16
	3	18	9	39	30	59	50	80	71	101	92	31	22
	4			32	20	53	41	74	62	95	83	41	29
	5			25	11	46	32	67	53	88	74	50	36
	6					42	21	63	42	84	63	61	40
93	2	35	26	64	56	94	85	123	114	152	144	30	21
	3	25	11	54	41	83	70	113	99	142	129	44	31
	4			44	26	73	56	102	85	132	114	59	42
	5			33	11	63	40	92	69	121	99	75	52
	6					52	26	82	55	111	85	89	62
119	2	78	53	141	116	204	179	267	242	330	305	67	41
	3	58	20	120	83	183	145	246	208	309	271	100	62
	4			100	49	163	112	226	175	289	238	133	83
	5			79	16	142	79	205	142	268	205	166	103
	6					121	46	184	109	247	172	200	124
128	2	99	53	183	136	267	220	351	304	435	388	107	60
	3			153	83	237	167	321	251	405	334	160	90
	4			124	30	207	113	291	197	375	281	214	120
	5					177	60	261	144	345	227	267	150
	6					147	6	231	90	315	174	321	180
160	2	206	126	372	293	538	459	705	625	871	792	190	111
	3	158	39	325	206	491	372	657	539	824	705	277	158
	4			277	127	443	293	610	460	776	626	356	205
	5			229	40	396	206	562	373	728	539	443	253
	6					356	135	523	301	689	468	514	292
210	2	433	283	777	627	1121	971	1465	1315	1809	1659	370	220
	3	323	98	667	442	1011	786	1355	1130	1699	1474	555	330
	4			557	257	901	601	1245	945	1589	1289	740	440
	5			446	72	790	416	1134	760	1478	1104	925	551
	6					680	230	1024	573	1368	917	1112	661
255	2	1072	762	1917	1607	2762	2453	3607	3298	4452	4143	843	534
	3	805	341	1650	1186	2495	2031	3340	2876	4185	3721	1265	801
	4			1383	764	2228	1609	3073	2454	3919	3299	1687	1068
	5			1116	342	1961	1188	2806	2033	3652	2878	2108	1335
	6					1695	766	2540	1611	3385	2456	2530	1601

S92 DOUBLE ACTING/S93 SPRING RETURN



IMPERIAL DIMENSIONS - Inches

Size Air NPT	48 1/8	63 1/4	83 1/4	93 1/4	119 1/4	128 1/4	160* 1/4	210 1/4	255† G1/4
A ISO "F"†	1.42 - F 03	1.97 - F 05	1.97 - F 05	1.97 - F 05	2.76 - F 07	2.76 - F 07	—	4.92 - F 12	6.50 - F 16
B ISO "F"†	1.97 - F 05	2.76 - F 07	2.76 - F 07	2.76 - F 07	4.92 - F 12	4.92 - F 12	4.92 - F 12	6.50 - F 16	7.87x4.72 Rect.
C	.40	.55	.75	.75	1.18	1.18	1.18	1.97	2.51
D	.32	.40	.51	.51	.87	.87	.87	.47	.63
Cs	.71	.71	.87	.87	1.43	1.43	1.43	2.37	2.37
Ds	.55	.55	.67	.67	1.07	1.07	1.07	1.81	1.81
E	3.88	4.53	5.43	5.78	7.28	8.09	9.36	11.62	13.49
F	4.38	5.58	7.40	9.10	12.40	12.81	15.54	19.57	28.78
G (UNC)	#10-32 x .23	1/4-20 x .32	1/4-20 x .32	1/4-20 x .32	5/16-18 x .46	5/16-18 x .46	—	1/2-13 x .78	M20 x 2.5 x 30mm
H (UNC)	1/4-20 x .25	5/16-18 x .40	5/16-18 x .40	5/16-18 x .40	1/2-13 x .69	1/2-13 x .69	1/2-13 x .75	5/8-11 x 1.11	M20 x 2.5 x 30mm
J	.38	.38	.50	.50	1.12	1.12	1.12	1.12	1.12
L	1.30	1.38	1.46	1.46	2.20	2.20	2.20	2.76	4.25
Ls	.58	.63	.75	1.18	1.59	1.59	1.59	2.61	2.61
M	2.50	3.46	4.27	4.61	5.52	6.32	7.80	10.16	12.06
N	1.60	1.72	2.28	2.47	2.78	2.88	3.78	4.56	5.40
P	1.18	1.38	1.79	1.97	2.37	2.70	3.39	4.41	5.39
Q	.196**	3.16	3.16	3.16	3.16	3.16	5.12	5.12	5.12
S	1.25	.89	1.26	1.32	1.64	1.64	2.26	2.45	2.48
T	1.10**	.79	.79	.79	.79	.79	1.18	1.18	1.18
U	.47	.47	.47	.47	.47	.47	.75	.75	.75

Note:

- Double Acting and Spring Return actuators have the same overall dimensions. The double acting unit of the size 48 actuator is optionally available with flat end caps with an F dimension of 4.00.
- Cs, Ds, and Ls: Star Drive dimension.
- † ISO "F" means mounting flange-drilling pattern.
- * Dimensions for Size 160A in table. Size 160B (keyed stem version) has C dimension of 1.38 and D dimension of .39
- ‡ Dimensions for Size 255A in table. Size 255B actuator has a C dimension of 3.00 and D dimension of .75
- ** Size 48 has a Q dimension of 3.16 and a T dimension of .79 with use of NAMUR top plate.

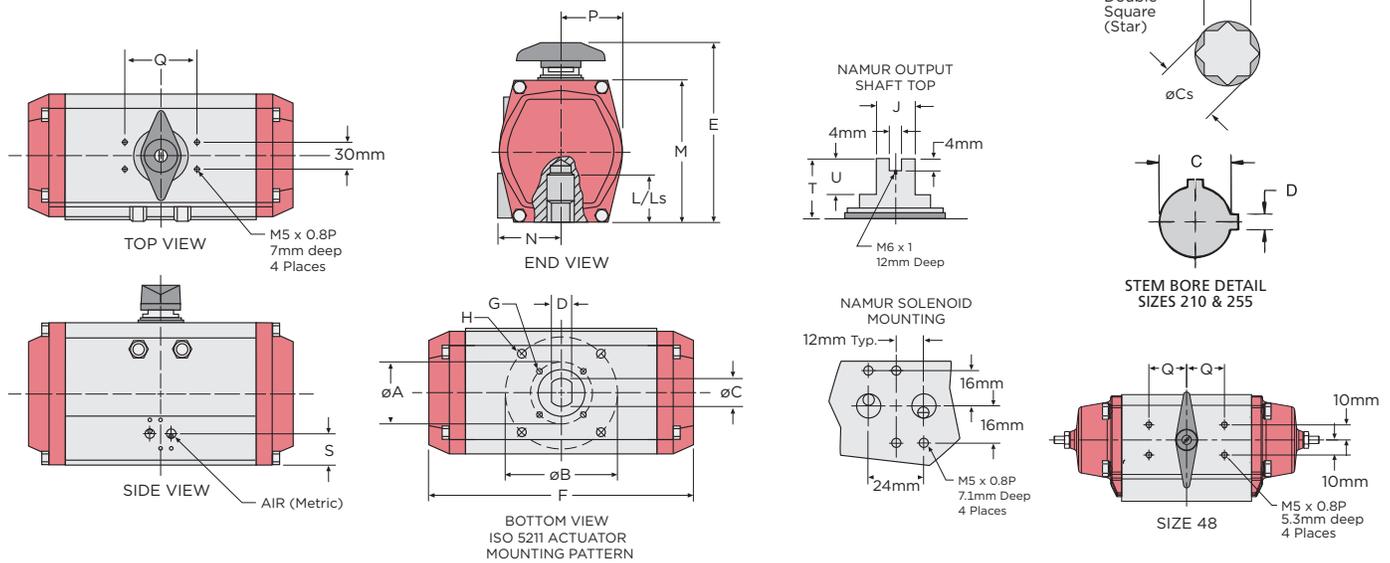
WEIGHTS - lbs - Spring Return unit weights are with full set of springs on each piston.

Size	48	63	83	93	119	128	160	210	255
Double Acting	2.0	3.4	6.3	8.5	16.9	21.0	38.8	77.8	167.0
Spring Return	2.4	4.10	8.1	10.8	22.3	27.6	53.2	109.6	210.8

Drawings are for reference only. Please refer to Bray ES drawings on the Bray website, www.bray.com. Bray reserves the right to change product dimensions without notice.

DIMENSIONS - METRIC

S92 DOUBLE ACTING/S93 SPRING RETURN



METRIC DIMENSIONS - Millimeters

Size	48	63	83	93	119	128	160*	210	255†
Air	G1/8	G1/4	G1/4	G1/4	G1/4	G1/4	G1/4	G1/4	G1/4
A ISO "F"†	36 - F 03	50 - F 05	50 - F 05	50 - F 05	70 - F 07	70 - F 07	—	125 - F 12	165 - F 16
B ISO "F"†	50 - F 05	70 - F 07	70 - F 07	70 - F 07	125 - F 12	125 - F 12	125 - F 12	165 - F 16	200 x120 Rect.
C	10	14	19	19	30	30	30	50	64
D	8	10	13	13	22	22	22	12	16
Cs	18	18	22	22	36	36	36	60	60
Ds	14	14	17	17	27	27	27	46	46
E	99	115	138	147	185	205	238	295	343
F	111	142	188	231	315	325	395	497	731
G	M5x0.8 x 5.8mm	M6x1.0 x 8mm	M6x1.0 x 8mm	M6x1.0 x 8mm	M8x1.25P x 12 mm	M8x1.25P x 12 mm	N/A	M12x1.75P x 19mm	M20x2.5P x 30mm
H	M6x1.0 x 6.4mm	M8x1.25P x 10mm	M8x1.25P x 10mm	M8x1.25P x 10mm	M12x1.75P x 18mm	M12x1.75P x 18mm	M12x1.75P x 18mm	M20x2.5P x 30mm	M20x2.5P x 30mm
J	10	10	13	13	28	28	28	28	28
L	33	35	37	37	56	56	56	70	108
Ls	15	16	19	30	40	40	40	66	66
M	64	88	108	117	140	161	198	258	306
N	41	44	58	63	71	73	96	116	137
P	30	35	45	50	60	69	86	112	137
Q	50**	80	80	80	80	80	130	130	130
S	32	23	32	34	42	42	57	62	63
T	28**	20	20	20	20	20	30	30	30
U	12	12	12	12	12	12	19	19	19

Note:

- Double Acting and Spring Return actuators have the same overall dimensions. The double acting unit of the size 48 actuator is optionally available with flat end caps with an F dimension of 102mm.
- Cs, Ds, and Ls: Star Drive dimension.
- † ISO "F" means mounting flange-drilling pattern.
- * Dimensions for Size 160A in table. Size 160B (keyed stem version) has C dimension of 35mm and D dimension of 10mm
- ‡ Dimensions for Size 255A in table. Size 255B actuator has a C dimension of 76mm and D dimension of 19mm
- ** Size 48 has a Q dimensions of 80mm and a T dimension of 20mm with use of NAMUR top plate.

WEIGHTS - Kg - Spring Return unit weights are with full set of springs on each piston.

Size	48	63	83	93	119	128	160	210	255
Double Acting	0.9	1.5	3	4	8	10	18	35	76
Spring Return	1.1	1.9	4	5	10	13	24	50	96

Drawings are for reference only. Please refer to Bray ES drawings on the Bray website, www.bray.com. Bray reserves the right to change product dimensions without notice.

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