

# Bettis D-Series

## Technical data pneumatic Rack and Pinion actuators



## Data sheet

Sheet No.: DPI 1.01 Rev. A  
Date: April 2010

# D-Series

# Technical details

## Standard actuator

### Specifications

#### Pressure range:

Double acting	3 to 120 psig	0.2 - 8 barg
Spring return	43 to 120 psig	3 - 8 barg

#### Torque range:

130 to 14874 In.lbf at 80 psig supply pressure.  
14.6 to 4955 Nm at 6 barg supply pressure.

See torque datasheets:

- \* DPI 3.01 (Double Acting)
- \* DPI 3.02 (Spring Return)

#### Operating media:

\* Air, dry or lubricated and inert gasses. Air, dry or lubricated and inert gasses. Dew point 10 K below operating temperature. For temperatures below 32°F (0°C) take appropriate measures to prevent freezing of condensate.

#### Basic Temperature ranges:

Standard:	-4°F to 176°F	-20° to +80°C
Optional high:	-4°F to 248°F	-20° to +120°C
Optional low:	-40°F to 176°F	-40° to +80°C

(see data sheet DPI 5.02 or DPI 5.03 for high or low temperature applications)

#### Lubrication :

Factory lubricated for the normal life of the actuator.

#### Construction:

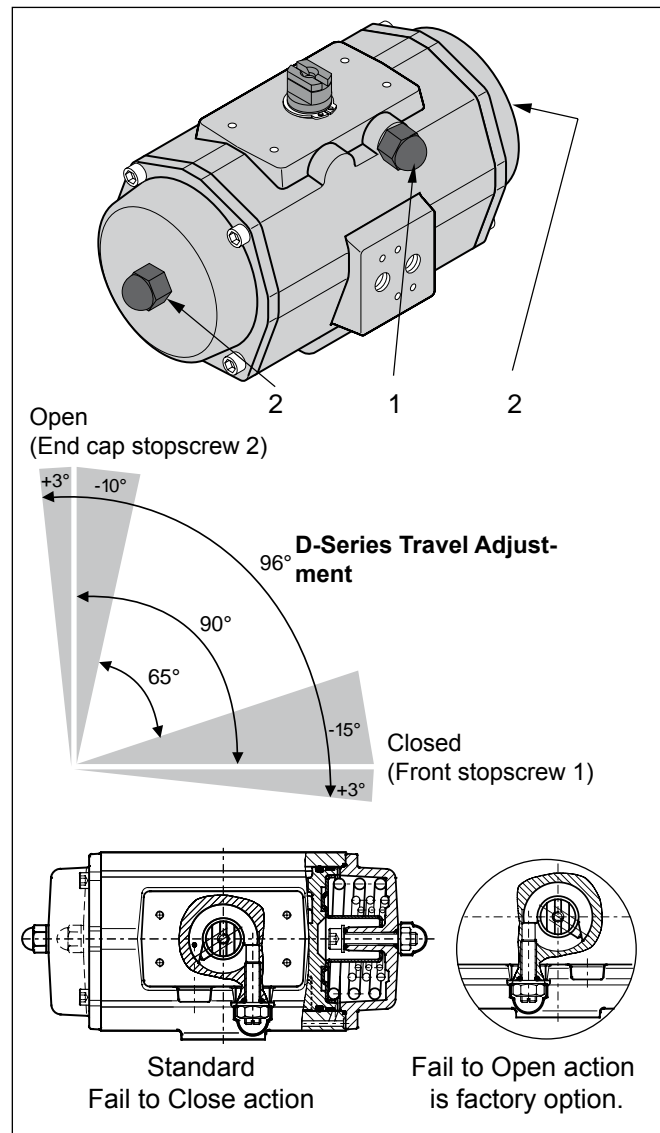
Suitable for indoor and outdoor installation.

#### Finish:

Polyester non-TGIC based powder coating (see data sheet DPI 6.01)

#### Rotation:

- \* 90° Nominal
- \* Double acting : Standard counter clockwise with port "A" pressurized (mode A, see data sheet DPI 7.01 for other assembly codes).
- \* Spring return : Clockwise fail action (mode A, see data sheet DPI 7.02 for other assembly codes).



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# Data sheet

Sheet No.: DPI 1.02 Rev. A  
Date: April 2010

# D-Series

### Technical data:

Actuator type		D12	D25	D40	D65	D100	D150	D200	D350	D600	D950	D1600
<b>Bore</b>	mm.	46	56	70	80	91	103	110	145	175	200	230
<b>Stroke</b>	mm.	12.6	15.7	18.8	22	25.1	31.4	37.7	37.7	44	50.3	62.8
<b>Weight:</b>	Double acting	kg.	0.6	1.3	1.8	2.4	3.1		5.8	10.4	19.4	42.7
	Spring return	kg.	0.7	1.7	2.4	3.6	4.6		9.1	16.9	27.6	65.8
<b>Operating time</b> <sup>(1)</sup>	sec.	0.4	0.5	0.7	1.1	1.2	1.8	2.3	3.6	4.5	5.4	6.9
<b>Air consumption</b> <sup>(2)</sup> at 1 atm (litres)	port A	stroke	0.1	0.1	0.2	0.3	0.4	0.84	0.8	1.8	2.9	4.7
	port B	stroke	0.1	0.1	0.2	0.4	0.5	0.78	1	1.9	3.1	4.9

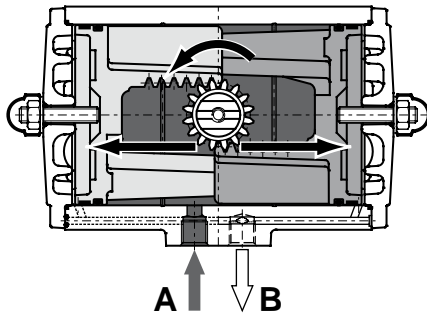
### Note:

1. Operating time is average with actuator under load and solenoid valve fitted.
2. Air consumption is the actual free air volume at 1 atm.
3. Pressure is in barg.
4. DD = Double acting  
DS = Single acting (Spring Return)

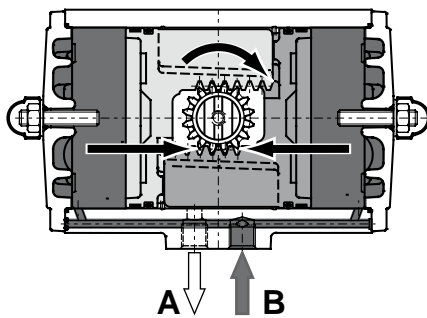
## Operating principle

### Double acting actuator

- If port "A" is pressurised and port "B" is vented, both the pistons move outwards to the endpositions.
- The moving pistons cause the pinion to rotate counter clock wise.



- If port "B" is pressurised and port "A" is vented, both the pistons move inwards to their block positions.
- The moving pistons cause the pinion to rotate clock wise.

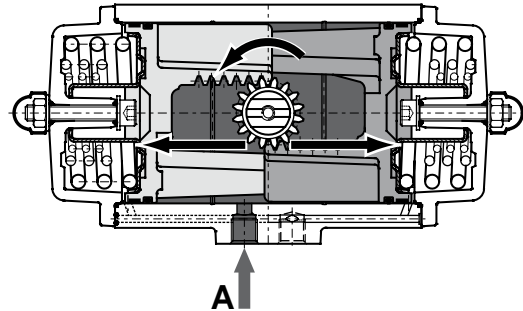


### Note:

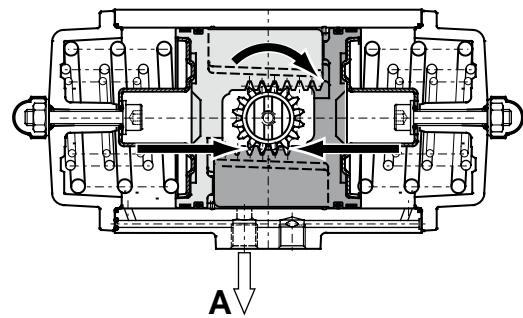
The above described operating principle is applicable for standard actuators (assembly mode A). For reverse acting actuators (assembly mode D), pressurizing the ports will result in a oposite rotation.

### Single acting (spring return) actuator

- If port "A" is pressurised and port "B" is vented, both the pistons move outwards compressing the springs.
- The moving pistons cause the pinion to rotate counter clock wise.



- If port "A" is vented, the spring force applied to the pistons move them inwards to their block positions.
- The moving pistons cause the pinion to rotate clock wise.



### Note:

The above described operating principle is applicable for standard "Fail to Close" actuators (assembly mode A). For reverse acting "Fail to Open" actuators (assembly mode D), pressurizing the ports will result in a oposite rotation.

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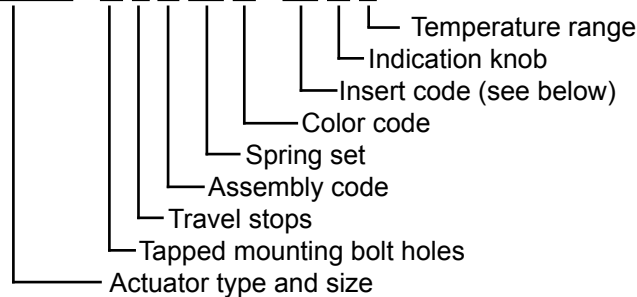
## Data sheet

Sheet No.: DPI 2.01 Rev. B  
Date: August 2010

# D-Series

# Pneumatic Actuator Configuration

**DS0040 . B 2 A 04 K . 14 K 0**



### Actuator Size and Type

DD D-Series & Double-Acting or  
DS D-Series & Spring-Return  
XXXX Body size (0012, 0025, 0040, 0065, 0100,  
0150, 0200, 0350, 0600, 0950 or 1600)

### Tapped, Mounting Bolt Holes

B UNC (Standard Bettis Trim, ISO 5211 with  
UNC bolt holes on valve mounting side, Metric  
bolt holes on NAMUR patterns NPT ports)  
*see data sheet DPI 4.01 or DPI 4.02*

### Travel Stops

2 Dual Travel Stops (Standard Bettis Trim for all  
models except for 0012)  
0 No Travel Adjustment (Only for model 0012)

### Assembly Modes

A Standard Bettis Trim Fail-CW (Mounted in line,  
standard)  
B Fail-CW (mounted across line, special order)  
C Fail CCW (mounted across line, special order)  
D Fail CCW (mounted in line, special order)  
*see data sheet DPI 7.01 or DPI 7.02*

### Spring Set Number

00 No springs (Double-Acting)  
01, 02, Spring set (Spring-Return only)  
03, 04,  
05 or 06  
*see data sheet DPI 3.02 or DPI 8.01*

### Color Code

K Bettis orange

### Insert Code – Inner Square

XX Bettis standard will be the ISO size,  
*see data sheet DPI 4.03*

### Indication Knob

D Visual Indication (Disk, use only when required  
with switch for visual indication)  
K Visual Indication (Knob, Standard)  
N No Visual Indicator

### Temperature Range

0 Standard Temperature -4°F to +175°F  
(-20°C to 80°C), *see data sheet DPI 5.01*  
1 High Temperature -4°F to 250°F  
(-20°C to 121°C), *see data sheet DPI 5.03*  
2 Low Temperature -40°F to 175°F  
(-40°C to 80°C), *see data sheet DPI 5.02*

Note:

For temperatures outside these ranges contact Bettis

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# Data sheet

Sheet No.: DPI 3.01 Rev. A  
Date: April 2010

# D-Series

## Torque (In.lb.)

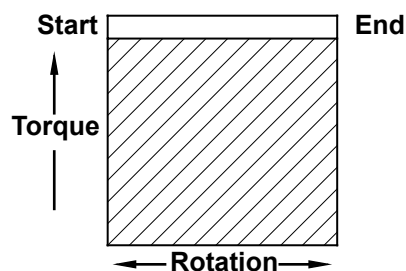
### DD - Double acting actuators

Actuator	Torque of double acting actuators (in In.lb)													
	Supply pressure (psi)													
Type	Size	30	35	40	45	50	55	60	70	75	80	90	100	120
DD	12	43.9	51.4	58.9	66.4	73.9	81.4	88.9	104	111	119	134	149	179
DD	25	81.4	95.3	109	123	137	151	165	193	206	220	248	276	332
DD	40	153	179	205	231	257	283	309	361	387	413	466	518	622
DD	65	233	272	312	352	392	431	471	551	590	630	709	789	948
DD	100	344	402	461	520	578	637	696	813	872	930	1048	1165	1400
DD	150	551	645	739	833	927	1021	1115	1303	1397	1491	1680	1868	2244
DD	200	754	883	1011	1140	1269	1398	1527	1784	1913	2042	2299	2557	3072
DD	350	1310	1534	1757	1981	2205	2428	2652	3100	3323	3547	3994	4442	5337
DD	600	2226	2606	2986	3366	3747	4127	4507	5267	5647	6028	6788	7548	9069
DD	950	3323	3890	4458	5025	5593	6160	6728	7862	8430	8997	10132	11267	13537
DD	1600	5493	6431	7369	8307	9245	10183	11121	12998	13936	14874	16750	18626	22379

**Note:**

- Emerson Process Management recommends that the valve manufacturer supply the maximum required torque values (Including any adjustments or suggested safety factors for valve service conditions or application). Additionally, the valve manufacturer must identify at which position(s) and direction(s) of rotation (Counter Clock Wise or Clock Wise) these maximum requirements occur.
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### Double Acting Torque



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# Data sheet

Sheet No.: DPI 3.02 Rev. B

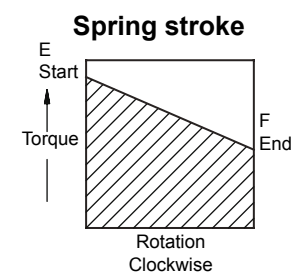
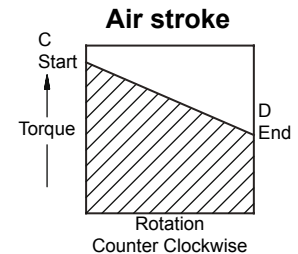
Date: June 2010

# D-Series

## Torque (In.lb.)

### DS - Single acting actuators (Spring Return)

Springset	Actuator Type	nr	Air Stroke (lbf/in)								Spring Stroke		
			SUPPLY PRESSURE (in PSI)								(lbf/in)		
			40		60		80		100				120
C	D	C	D	C	D	C	D	C	D	E	F		
DS 12	2	-	-	48	24	80	55	111	87	143	119	63	40
DS 25	2	71	44	130	103	189	162	248	221	306	280	62	39
	3	48	8	107	67	166	126	225	185	284	244	94	59
	4	-	-	85	31	144	90	203	149	262	208	125	78
	5	-	-	-	-	121	54	180	113	239	172	156	98
	6	-	-	-	-	-	-	158	77	217	136	188	117
DS 40	2	133	82	243	193	354	303	464	414	575	524	117	73
	3	91	15	201	125	312	236	422	346	533	457	176	110
	4	-	-	159	58	270	169	380	279	491	390	234	146
	5	-	-	-	-	228	101	338	212	449	322	293	183
	6	-	-	-	-	-	-	296	144	406	255	351	220
DS 65	2	196	117	365	285	533	454	701	622	870	790	186	117
	3	-	-	297	178	466	347	634	515	802	683	279	176
	4	-	-	230	71	398	240	567	408	735	576	372	234
	5	-	-	-	-	331	133	500	301	668	470	465	292
	6	-	-	-	-	-	-	432	194	601	363	558	351
DS 100	2	303	192	552	441	801	690	1050	939	1299	1188	258	161
	3	211	44	460	293	709	542	958	791	1206	1039	387	242
	4	-	-	367	144	616	393	865	642	1114	891	516	323
	5	-	-	-	-	523	245	772	494	1021	743	646	403
	6	-	-	-	-	430	96	679	345	928	594	775	484
DS 150	2	486	297	884	696	1283	1094	1681	1493	2080	1892	423	259
	3	337	54	735	453	1134	852	1533	1250	1931	1649	634	388
	4	-	-	587	210	985	609	1384	1007	1783	1406	845	517
	5	-	-	-	-	837	366	1235	764	1634	1163	1056	647
	6	-	-	-	-	-	-	1087	522	1485	920	1268	776
DS 200	2	656	406	1202	952	1747	1498	2293	2043	2838	2589	579	362
	3	448	74	994	619	1539	1165	2085	1710	2631	2256	868	542
	4	-	-	786	287	1332	832	1877	1378	2423	1924	1158	723
	5	-	-	-	-	1124	500	1669	1045	2215	1591	1447	904
	6	-	-	-	-	-	-	1462	713	2007	1258	1736	1085
DS 350	2	1105	684	2053	1632	3001	2580	3949	3528	4897	4476	1025	658
	3	-	-	1675	1043	2623	1991	3571	2939	4519	3887	1537	987
	4	-	-	1297	455	2245	1403	3193	2351	4141	3299	2049	1317
	5	-	-	-	-	1866	814	2814	1762	3762	2710	2561	1646
	6	-	-	-	-	-	-	2436	1173	3384	2121	3074	1975
DS 600	2	1920	1183	3531	2794	5142	4405	6753	6016	8364	7628	1723	1082
	3	-	-	2909	1804	4520	3415	6131	5026	7742	6637	2585	1624
	4	-	-	2287	814	3898	2425	5509	4036	7120	5647	3446	2165
	5	-	-	-	-	3276	1434	4887	3046	6498	4657	4308	2706
	6	-	-	-	-	-	-	4265	2055	5876	3666	5169	3247
DS 950	2	2898	1777	5303	4182	7708	6587	10113	8992	12518	11397	2563	1587
	3	-	-	4391	2709	6796	5114	9201	7519	11606	9924	3844	2381
	4	-	-	3479	1236	5884	3641	8288	6046	10693	8451	5125	3175
	5	-	-	-	-	4971	2168	7376	4573	9781	6978	6407	3968
	6	-	-	-	-	-	-	6464	3100	8869	5505	7688	4762
DS 1600	2	4765	2988	8741	6964	12716	10939	16692	14915	20668	18890	4193	2646
	3	3244	578	7220	4554	11196	8530	15171	12505	19147	16481	6289	3970
	4	-	-	5699	2145	9675	6120	13650	10096	17626	14071	8385	5293
	5	-	-	-	-	8154	3711	12129	7686	16105	11662	10481	6616
	6	-	-	-	-	-	-	10608	5277	14584	9252	12578	7939



#### Notes:

- Emerson Process Management - Valve Automation recommends that the valve manufacturer supply the maximum required torque values (Including any adjustments or suggested safety factors for valve service conditions or application). Additionally, the valve manufacturer must identify at which position(s) and direction(s) of rotation (Counter Clock Wise or Clock Wise) these maximum requirements occur.
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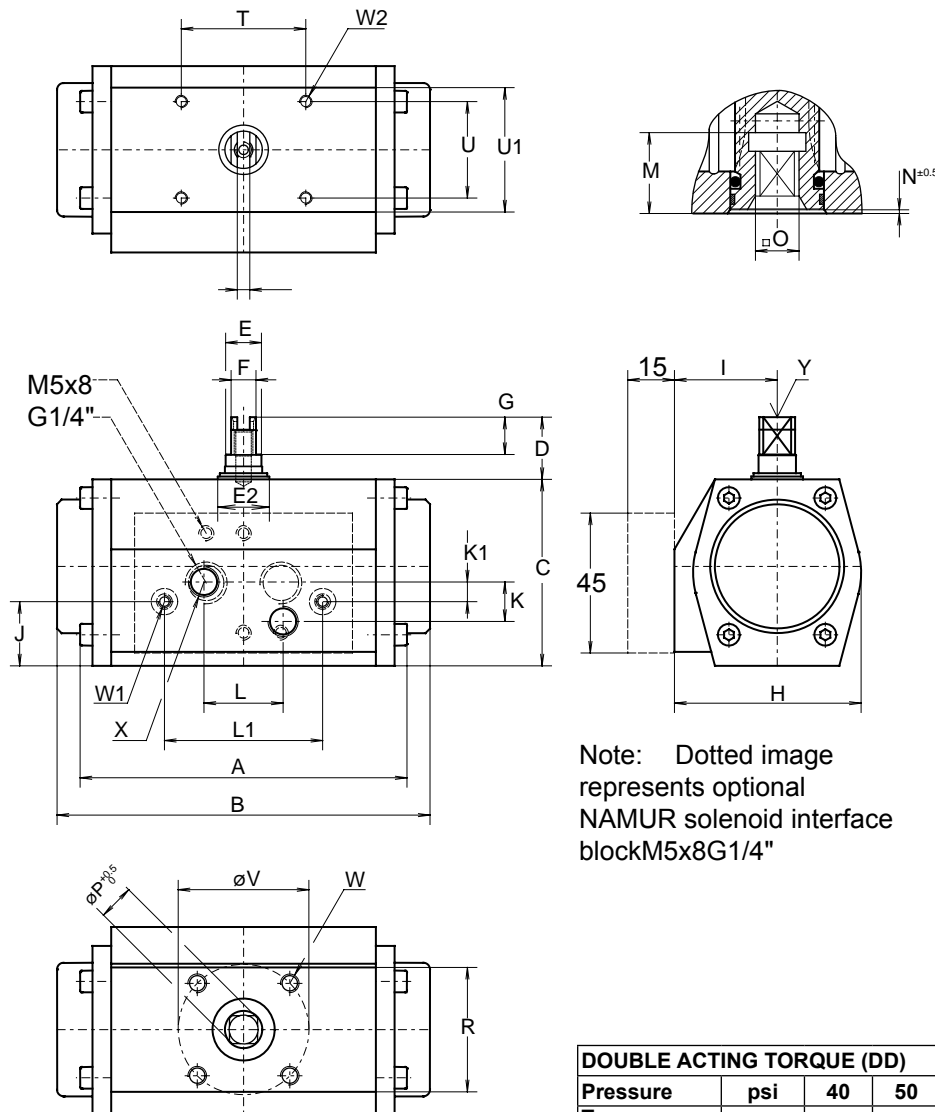
# Data sheet

Sheet No.: DPI 4.01 Rev. A  
Date: April 2010

# D-Series

## Dimensions and Torque

### DD/DS12



Dim. in Inches	
A DD	4.06
B DS	4.65
C	2.36
D	0.79
E	0.63
E2	0.91
F	0.39
G	0.47
H	2.36
I	1.30
J	0.83
K	0.50
K1	0.25
L	1.00
L1	2.00
M	0.65
N	0.039
Omax.	0.358
Omin.	0.354
P	0.476
R	1.57
R1	1.57
T	1.57
U	1.22
V	1.654
W	10-24 UNCx.24"
W1	10-24 UNCx.24"
W2	10-24 UNCx.24"
X	1/8"NPT
Y	M6x.48

Note: Dotted image represents optional NAMUR solenoid interface block M5x8G1/4"

DOUBLE ACTING TORQUE (DD)									
Pressure	psi	40	50	60	70	80	90	100	120
Torque 90°/180°	(in.lb.)	59	74	89	104	119	134	149	179
SINGLE ACTING TORQUE (DS)									
Pressure	psi	Air stroke						Spring stroke	
		60		80		100		start	end
Position	-	start	end	start	end	start	end		
Torque 90°	(in.lb.)	48	23	80	55	112	87	64	41
Torque 180°	(in.lb.)	49	25	81	57	112	88	63	40

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# Data sheet

Sheet No.: DPI 4.02 Rev. A

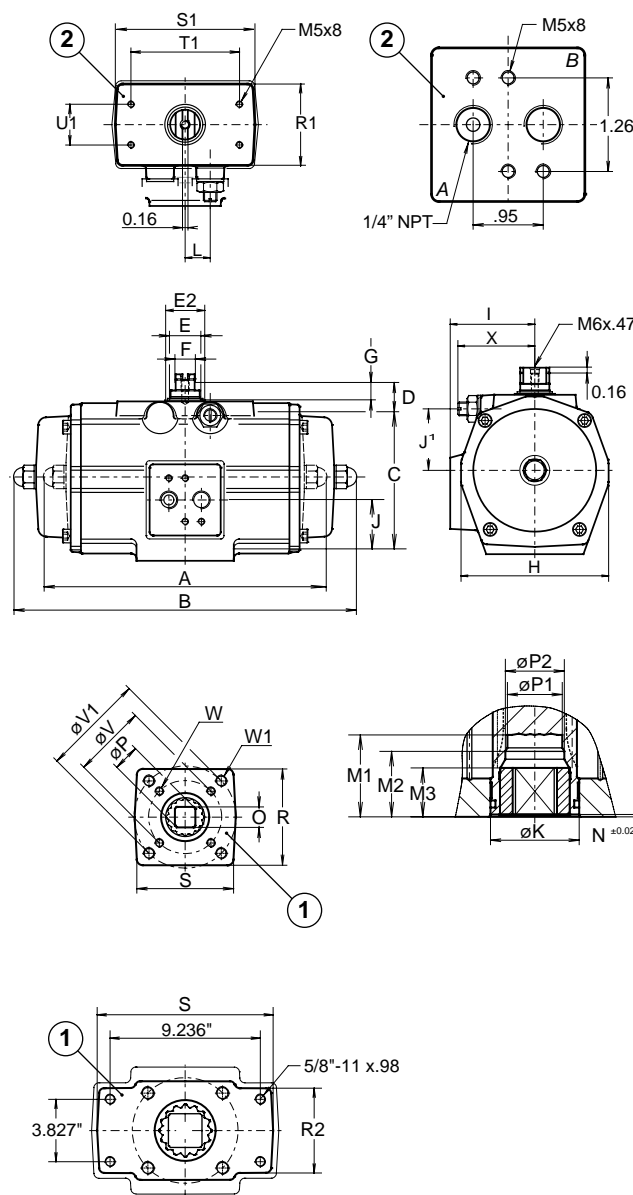
Date: April 2010

# D-Series

## Dimensions

### DD & DS - Actuators

Dim. in inch	D-Series actuators									
	D 25	D 40	D 65	D100	D150	D200	D 350	D600	D950	D1600
A = DD	6.26	7.09	7.83	8.70	10.00	11.14	12.01	15.24	16.69	20.31
B = DS	6.77	8.03	9.80	10.51	12.20	14.17	15.24	18.78	20.35	25.08
C	3.15	3.66	4.13	4.65	5.51	5.63	7.13	8.66	10.20	11.69
D	0.79	0.79	0.79	0.79	0.79	0.79	0.79	1.18	1.18	1.18
E	0.63	0.87	0.87	0.87	1.42	1.42	1.42	2.17	2.17	2.52
E2	0.91	1.18	1.18	1.18	1.77	1.77	1.77	2.56	2.56	2.95
F	0.39	0.55	0.55	0.55	0.75	0.75	0.75	1.42	1.42	1.42
G	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.39	0.39	0.39
H	2.91	3.39	3.86	4.25	4.76	5.04	6.81	8.15	9.09	10.43
I	1.81	2.09	2.26	2.48	2.76	2.87	3.71	4.45	4.96	5.59
J	1.26	1.32	1.54	1.59	1.59	1.99	2.85	3.33	4.15	4.74
J1	1.11	1.38	1.57	1.72	1.92	2.12	2.85	3.50	4.03	4.50
K	0.94	1.30	1.30	1.50	2.17	2.17	2.17	2.68	2.95	3.74
L	0.45	0.61	0.61	0.73	0.97	0.97	0.97	1.63	1.63	1.87
M1	1.36	1.36	1.36	1.36	1.97	1.97	1.97	2.05	2.52	3.23
M2	-	-	-	1.06	-	1.46	1.46	-	-	-
M3	0.669	0.669	0.669	0.787	0.787	1.161	1.161	1.161	1.949	2.303
N	0.04	0.04	0.04	0.06	0.04	0.06	0.06	0.06	0.06	0.06
O max.	0.436	0.554	0.554	0.751	0.751	0.870	1.067	1.067	1.424	1.817
O min.	0.433	0.551	0.551	0.748	0.748	0.866	1.063	1.063	1.417	1.811
P	0.555	0.713	0.713	0.992	1.004	1.110	1.425	1.425	1.898	2.370
P1	0.555	0.713	0.831	0.909	1.122	1.303	1.303	1.437	1.909	2.382
P2	-	-	-	0.988	0.988	1.264	1.264	-	-	-
R	2.05	2.56	2.76	2.76	3.46	3.54	4.49	4.88	5.12	6.06
R1	1.97	1.97	1.97	2.36	2.36	2.36	2.36	3.54	3.54	4.92
R2	-	-	-	-	-	-	-	-	-	5.20
S	2.05	2.56	2.76	2.76	3.62	3.54	4.49	4.88	5.59	11.02
S1	3.94	3.94	3.94	3.94	3.94	3.94	3.94	6.69	6.69	8.27
T1	3.150	3.150	3.150	3.150	3.150	3.150	3.150	5.118	5.118	5.118
U1	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181
	F03	F05	F05	F05	F07	F07	F07	F10	F10	F16
V	1.417	1.969	1.969	1.969	2.756	2.756	2.756	4.016	4.016	6.496
W	10-24 x.31	1/4"- 20 x.39	1/4"- 20 x.39	1/4"- 20 x.39	1/4"- 20 x.39	5/16"- 18 x.39	5/16"- 18 x.39	3/8"- 16 x.63	3/8"- 16 x.63	3/4"-10 x1.14
	F05	F07	F07	F07	F10	F10	F10	F12	F14	-
V1	1.969	2.756	2.756	2.756	4.016	4.016	4.016	4.921	5.512	-
W1	1/4"- 20 x.39	5/16"- 18 x.39	5/16"- 18 x.39	5/16"- 18 x.39	5/16"- 18 x.39	3/8"- 16 x.63	3/8"- 16 x.63	1/2"- 13 x.79	5/8"- 11 x.98	-
X	1.42	1.63	1.63	1.99	2.36	2.46	2.85	4.02	4.02	4.31
X max.	1.63	1.91	1.91	2.30	2.64	2.91	3.31	4.51	4.51	4.88
Y	1/4"- 20	5/16"- 18	5/16"- 19	3/8"- 16	3/8"- 16	1/2"- 13	1/2"- 13	5/8"- 11	5/8"- 11	3/4"-10



**Note:**

1. Flange and square drive to ISO 5211
2. Top and solenoid flange to VDE/VDI 3845 (NAMUR)



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# Data sheet

Sheet No.: DPI 4.03 Rev. A  
Date: April 2010

# D-Series

## Drive inserts

### Description

Most of the Bettis D-Series actuators are fitted with drive inserts. This enables actuators to be directly mounted onto suitable valves and eliminates the need for a bracket and coupling type mounting kit. The use of direct mounts significantly cuts the cost of the valve/actuator assembly.

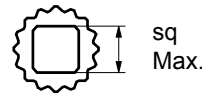
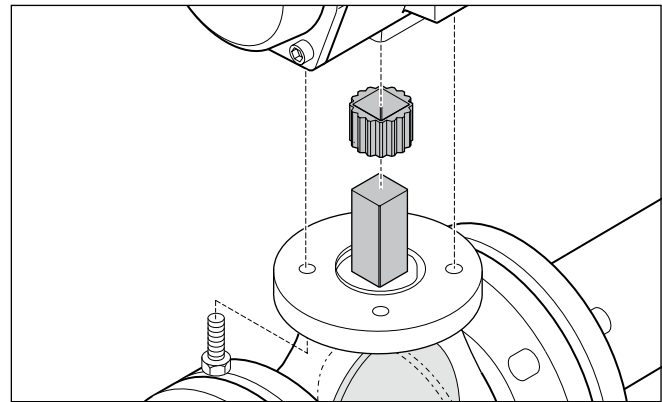
Standard actuators are fitted with square drive inserts in accordance with ISO 5211 (or DIN 3337), but a wide variety of other inserts are also available. Special inserts may have oversize or undersize squares, double-D and shaft key way forms.

Drive inserts can be supplied on factory built actuators or as loose items and are easily replaceable at distributor or end user level.

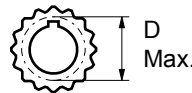
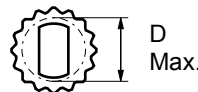
Where direct mounts are not possible, for instance on valves with exposed gland packing, the use of inserts often simplifies the design of the mounting kit.

Material: Aluminum alloy  
Finish : Anodized

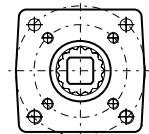
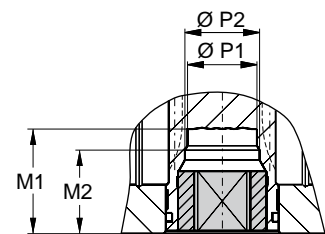
The 0012 actuator size does not have inserts, but has the inner square directly in the bottom of the pinion. See the following data sheet DPI 4.01 for more information.



Standard inserts



Optional inserts



Insert mounting acc. ISO 5211

Inserts with inner-square-dimensions per actuator type																		
	D25		D40 / D65		D100		D150		D200		D350		D600		D950		D1600	
	mm.	inch	mm.	inch	mm.	inch	mm.	inch	mm.	inch	mm.	inch	mm.	inch	mm.	inch	mm.	inch
<b>Standard inserts dimensions</b>																		
<b>ISO5211</b>	11	0.433	14	0.551	19	0.748	19	0.748	22	0.866	27	1.063	27	1.063	36	1.417	46	1.811
<b>Optional insert dimensions</b>																		
	9	0.354	10	0.394	12	0.472	14	0.551	14	0.551	14	0.551	14	0.551	22	0.866	-	-
	10	0.394	12	0.472	14	0.551	16	0.630	16	0.630	16	0.630	16	0.630	-	-	-	-
	-	-	-	-	16	0.630	22	0.866	17	0.669	17	0.669	17	0.669	-	-	-	-
	-	-	-	-	-	-	24	0.945	19	0.748	19	0.748	19	0.748	-	-	-	-
	-	-	-	-	-	-	27	1.063	24	0.945	24	0.945	24	0.945	-	-	-	-
<b>Maximum insert dimensions</b>																		
<b>M1</b>	34.5	1.36	34.5	1.36	34.5	1.36	50	1.97	50	1.97	50	1.97	52	2.05	64	2.52	82	3.23
<b>M2</b>	-	-	-	-	27	1.06	37	1.46	37	1.46	37	1.46	-	-	-	-	-	-
<b>P1</b>	14.1	0.56	18.1	0.71	23.1	0.91	28.5	1.12	32.1	1.26	32.1	1.26	36.5	1.44	48.5	1.91	60.5	2.38
<b>P2</b>	-	-	-	-	25.2	0.99	36.2	1.43	36.2	1.43	36.2	1.43	-	-	-	-	-	-
<b>Sq max.</b>	11	0.433	16	0.630	19	0.748	27	1.063	27	1.063	27	1.063	27	1.063	36	1.417	46	1.811
<b>D max.</b>	13.8	0.543	21	0.827	23.6	0.929	36.6	1.441	33.6	1.323	33.6	1.323	33.6	1.323	45	1.772	60	2.362



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# Data sheet

Sheet No.: DPI 5.01 Rev. B  
Date: February 2011

D-Series

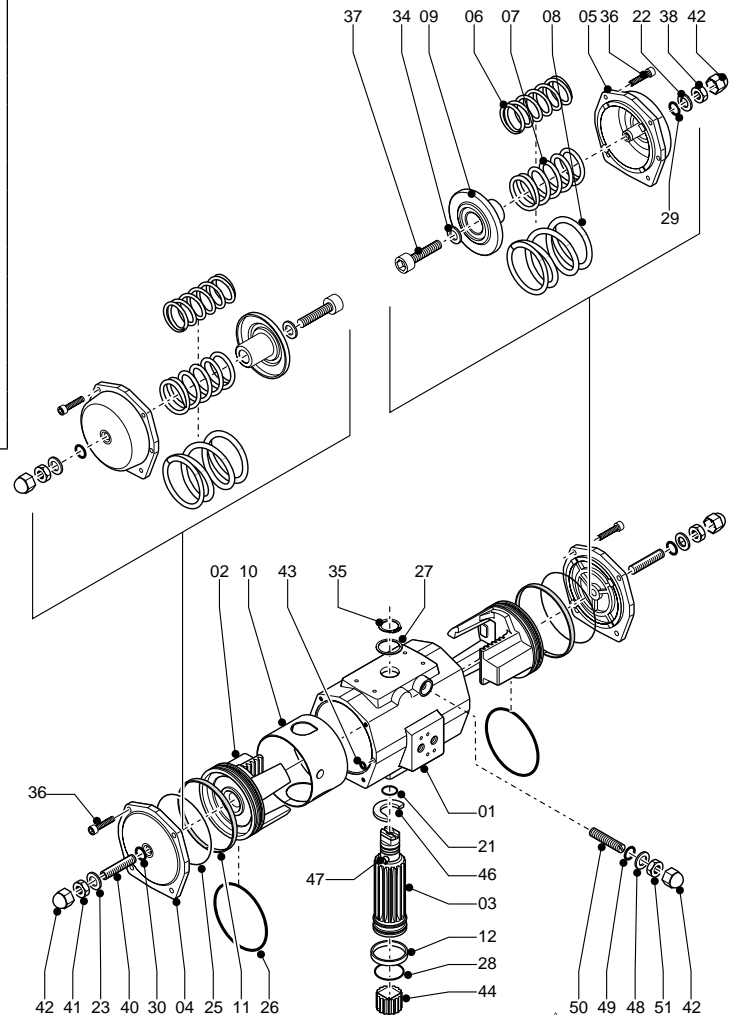
## Construction, Parts and Materials

### Standard Actuator

Parts			Materials	
Nr.	Description	Qty.	Description	Notes
1	Body	1	Aluminum Alloy	1
2	Piston	2	Aluminum Alloy	5
3	Drive Shaft	1	Aluminum Alloy	2
4	End Cap DD	2	Aluminum Alloy	-
5	End Cap DS	2	Aluminum Alloy	-
6	Spring- inner	2	Carbon Spring Steel	3
7	Spring- mid	2	Carbon Spring Steel	3
8	Spring- outer	2	Carbon Spring Steel	3
9	Spring Holder	2	Steel	4
10 *	Guide Band, body	1	Nylatron	-
11 *	Guide Band, piston	2	PTFE, Carbon filled	-
12 *	Bearing Bush, shaft bottom	1	Nylatron	-
21 *	O-ring, shaft top	1	Nitrile Rubber	-
22 *	Washer DS, end cap nut	2	Nylon	-
23 *	Washer DD, end cap nut	2	Nylon	-
25 *	O-ring, end cap	2	Nitrile Rubber	-
26 *	O-ring, piston	2	Nitrile Rubber	-
27 *	Washer, shaft top	1	ZEDEX 100 K	-
28 *	O-ring, shaft bottom	1	Nitrile Rubber	-
29 *	O-ring, limit stop bolt, DS	4	Nitrile Rubber	-
30 *	O-ring, limit stop bolt, DD	2	Nitrile Rubber	-
34	Washer DS	2	Steel	4
35 *	Spring Clip	1	Carbon Spring Steel	3
36	End Cap Bolt DD/DS	8	Stainless Steel	-
37	Limit Stop Bolt DS	2	Stainless Steel	-
38	Nut, DS	2	Stainless Steel	-
40	Limit Stop Bolt DD	2	Stainless Steel	-
41	Nut, DD	2	Stainless Steel	-

Parts			Materials	
Nr.	Description	Qty.	Description	Notes
42	Nut Cover	2	Polyethylene	-
43 *	O-ring, B-port	2	Nitrile Rubber	-
44	Insert	1	Aluminum Alloy	1
45	Threaded insert	8	Steel	4
46	Cam for stroke adjustment	1	Stainless Steel	-
47	Shaftpin for stroke adjustment	1	Chrome nickel steel	-
48 *	Washer	1	Nylon	-
49 *	O-ring Front Limit Stop bolt	1	Nitrile Rubber	-
50	Front Limitstop Bolt	1	Stainless Steel	-
51	Nut	1	Stainless Steel	-

\* Recommended spare parts (contained in Repair kits)



#### Notes

- 1 Anodized
- 2 "Aircraft grade" aluminum alloy, hard anodized
- 3 Deltatone Coating
- 4 Zinc plated and passivated
- 5 Dichromate treatment

#### Finish:

Standard : Polyester non-TGIC based powder coating  
(see data sheet DPI 6.01)

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## Data sheet

Sheet No.: DPI 5.02 Rev. A  
Date: April 2010

D-Series

# Construction, Parts and Materials

## Actuators for low temperature applications

### Description:

A double piston, rack and pinion pneumatic actuator incorporating a three point piston support system, anti-blowout spindle and with high duty synthetic bearings at all bearing points.

This version is a standard aluminium actuator, but incorporating parts and materials suitable for low temperature operation.

### Note:

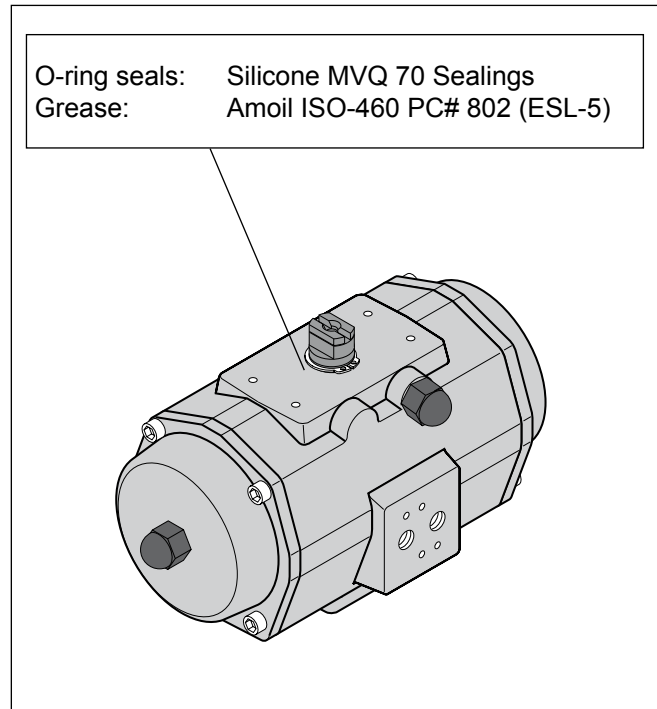
When operating actuators in sub-zero temperatures (< 0°C or < 32°F) care should be taken to counter the effects of freezing condensate inside the actuator.

### Specification:

Max. pressure: 8 bar ~ 120psi  
Torque: Standard  
Media: Air or non corrosive gas  
Temperature: -40°F to +176°F (-40°C to +80°C)  
Finish: Polyester non-TGIC based powder coating (see data sheet DPI 6.01).

### Spare parts:

Dedicated low temperature spare parts are available for maintenance or make a standard actuator suitable for low temperature operation.



Materials:			
Part	Material	Specifications	Remark
Housing	Aluminium Alloy	UNS A13600, ASTM B85	
Drive Shaft	Aluminium Alloy	UNS 1 77075, ASTM 7075 T6	Hard anodized
Piston	Aluminium Alloy	UNS A03560, ASTM B26	
Sealings	Silicone MVQ 70 O-rings	-/-	
Grease	Amoil ISO-460 PC# 802 (ESL-5)	-/-	
Shaft bearings	Top :	Delrin	POM
	Bottom :	Nylatron	PA6.6 + MoS2
Piston bearings	PTFE	25% Carbon filled	
Bodybearings	Nylatron	PA6.6 + MoS2	
Shaft thrust washer	ZEDEX 100 K	-/-	
End cap bolts	Stainless Steel	AISI 304 A2	
Springs	Carbon Spring Steel	UNS G10860, ASTM A228	Deltatone coating

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## Data sheet

Sheet No.: DPI 5.03 Rev. A  
Date: April 2010

D-Series

# Construction, Parts and Materials

## Actuators for high temperature applications

### Description:

A double piston, rack and pinion pneumatic actuator incorporating a three point piston support system, anti-blowout spindle and with high duty synthetic bearings at all bearing points.

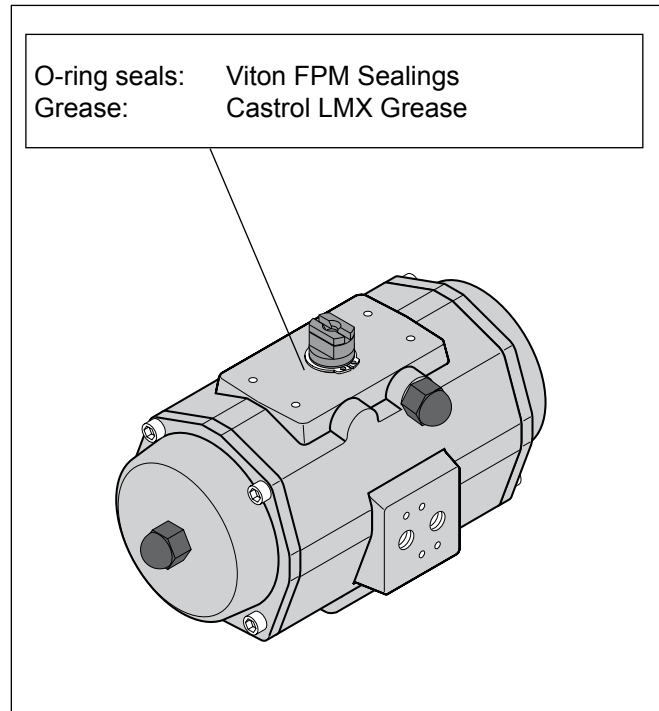
This version is a standard aluminium actuator, but incorporating parts and materials suitable for high temperature operation.

### Specification:

Max. pressure : 8 bar ~ 120psi  
Torque : Standard  
Media : Air or non corrosive gas  
Temperature : -4°F to +248°F (-20°C to +120°C)

### Spare parts:

Dedicated high temperature spare parts are available for maintenance or make a standard actuator suitable for high temperature operation.



Materials:			
Part	Material	Specifications	Remark
Housing	Aluminium Alloy	UNS A13600, ASTM B85	
Drive Shaft	Aluminium Alloy	UNS 1 77075, ASTM 7075 T6	Hard anodized
Piston	Aluminium Alloy	UNS A03560, ASTM B26	
Sealings	Viton FPM O-rings	-/-	
Grease	Castrol LMX	-/-	
Shaft bearings	Top :	Delrin	POM
	Bottom :	Nylatron	PA6.6 + MoS2
Piston bearings	PTFE	25% Carbon filled	
Bodybearings	Nylatron	PA6.6 + MoS2	
Shaft thrust washer	ZEDEX 100 K	-/-	
End cap bolts	Stainless Steel	AISI 304 A2	
Springs	Carbon Spring Steel	UNS G10860, ASTM A228	Deltatone coating

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## Data sheet

Sheet No.: DPI 6.01 Rev. A  
Date: April 2010

# D-Series

# Bettis D-Series corrosion protection system

## Description:

The corrosion protection system of the standard Bettis D-Series pneumatic actuators consist of the following treatments or materials:

### 1 De-greasing.

All aluminum parts are de-greased before the powder coating is applied by washing with an alkaline solution to assure the best bonding between the aluminum surface and the coating.

### 2 Powder coating.

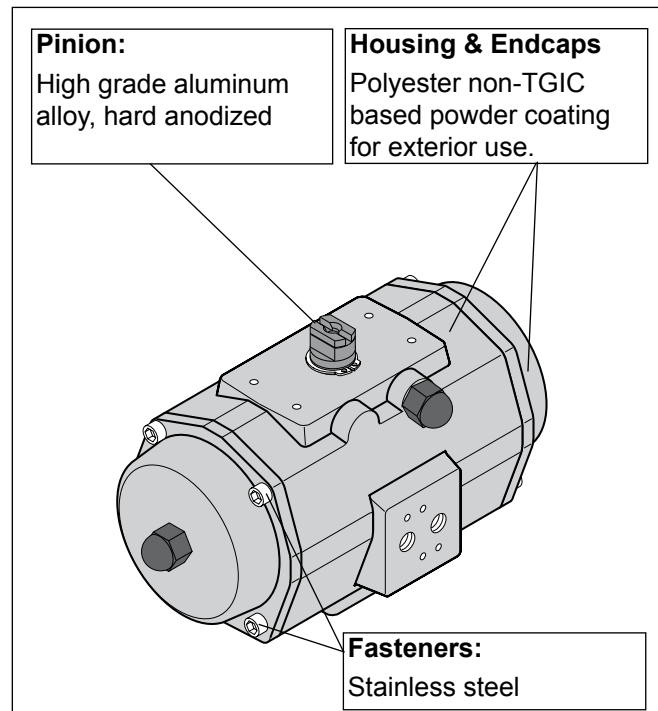
- Polyester non-TGIC based powder coating for exterior use.
- The powder coating is applied cold using automatic electrostatic spray equipment and is cured at minimum 190°C (374°F) offering excellent light and weather resistance.
- The powder coating thickness is 1.5 mils (37 microns) minimum, and 2 mils (50 microns) average.
- Good chemical resistance against most bases, acids, solvents, alkalis and oils at normal temperatures.
- Excellent exterior mechanical durability.
- The coating has passed a salt spray test according to ASTM B117 for 500 hours. The powder coating is virtually solvent free, and therefore environmentally friendly.

### 3 High grade & anodized aluminum pinion.

Actuators with high grade & anodized aluminum pinions, passed a 500 hours salt spray test. Optional stainless steel pinions are available with a higher corrosion resistance.

### 4 Stainless steel or Deltatone treated external steel parts.

External parts are stainless steel or steel alloy with a Deltatone® treatment.



## Technical data:

Coating	: Polyester non-TGIC based powder coating
Salt spray test	: DIN 50021 / ASTM B117: 500h.
Max. temperature	: -4°F to 176°F (-20° to + 80°C)
Color	: Bettis orange
Materials	: Housing : Aluminium alloy : Pinion : High grade aluminum alloy : Fasteners: Stainless steel or alloy steel with Deltatone treatment : Tagplate : Stainless steel
Application	: Standard Bettis D-Series pneumatic actuators.

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**Data sheet**

Sheet No.: DPI 7.01 Rev. A  
Date: April 2010

**D-Series**

# Assembly modes

## DD - Double acting actuator

1 = A-port pressurized  
2 = B-port pressurized

All views are from above  
Pistons are shown in inner position

Rotate complete standard Mode A actuator 90° and rotate the visual indicator back 90°.

<b>STANDARD</b> MOUNTING IN LINE	<b>A</b>	<b>B</b>	MOUNTING ACROSS LINE
MOUNTING ACROSS LINE	<b>C</b>	<b>D</b>	MOUNTING IN LINE

**Important:**  
When a standard "Mode-A" actuator is re-assembled to "Mode D", the end cap and front stop-screws will adjust the closed position. There is no adjustment for the open position!

Rotate complete Mode "D" actuator 90° and rotate the visual indicator back 90°.

Pistons turned 180° (from standard)

Factory option: Mode "D" Pinion      Factory option: Mode "D" Housing



**Data sheet**

Sheet No.: DPI 7.02 Rev. A  
Date: April 2010

**D-Series**

# Assembly modes

## DS - Single acting (Spring Return) actuator

1 = A-port pressurized  
2 = Spring stroke

All views are from above  
Pistons are shown in inner position

Rotate complete standard Mode A actuator 90° and rotate the visual indicator back 90°.

<b>Spring-to-Close (ROTATION CW)</b>			
<b>STANDARD</b>	<b>A</b>	<b>B</b>	
MOUNTING IN LINE			MOUNTING ACROSS LINE
MOUNTING ACROSS LINE	<b>C</b>	<b>D</b>	MOUNTING IN LINE
<b>Spring-to-Open (ROTATION CCW)</b>			

Rotate complete Mode "D" actuator 90° and rotate the visual indicator back 90°.

Pistons turned 180° (from standard)

**Important:**  
When a standard "Mode-A" actuator is re-assembled to "Mode D", the end cap and front stop-screws will adjust the closed position. There is no adjustment for the open position!



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**Data sheet**

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Date: April 2010

D-Series

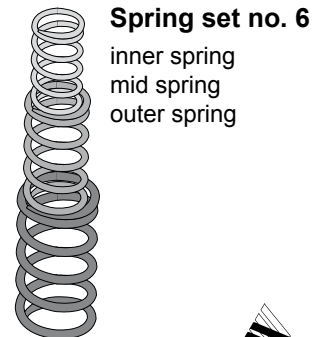
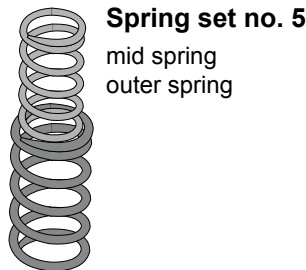
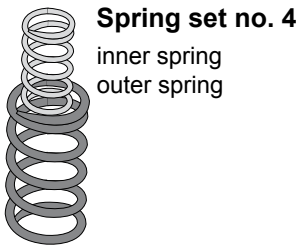
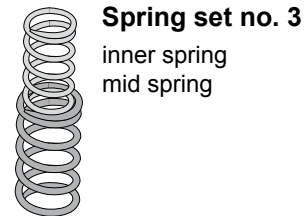
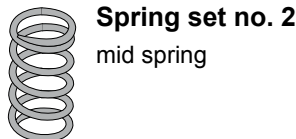
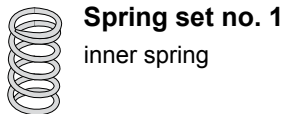
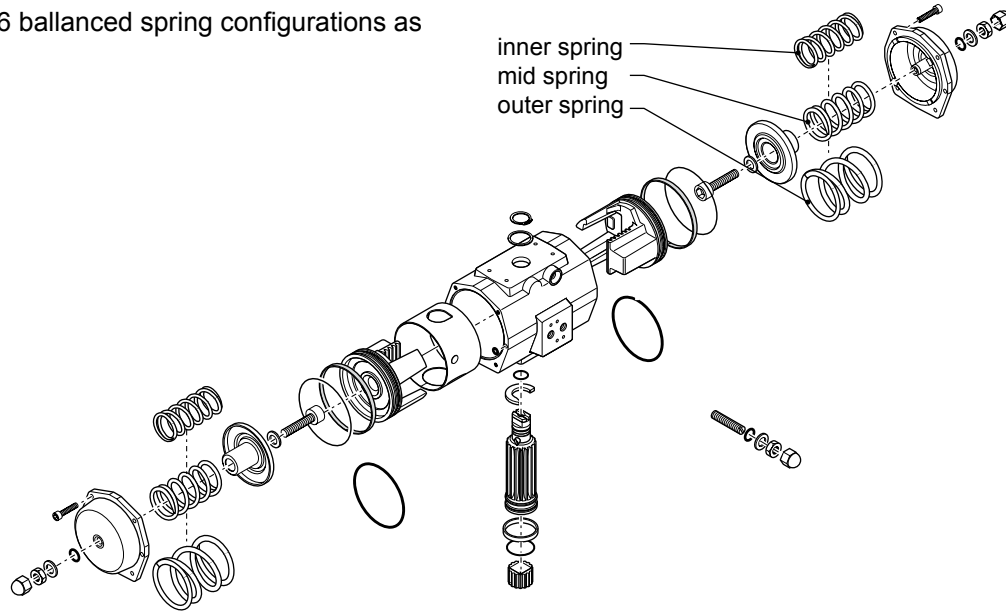
# Springset configuration

## DS - Single acting (Spring Return) actuator

### Springsets

Bettis DS Single acting (Spring Return) actuators have up to 3 different concentric springs on each side of the actuator.

This allows up to 6 ballanced spring configurations as shown below.



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## Data sheet

Sheet No.:

Date:

# D-Series

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# D-Series

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# D-Series

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