

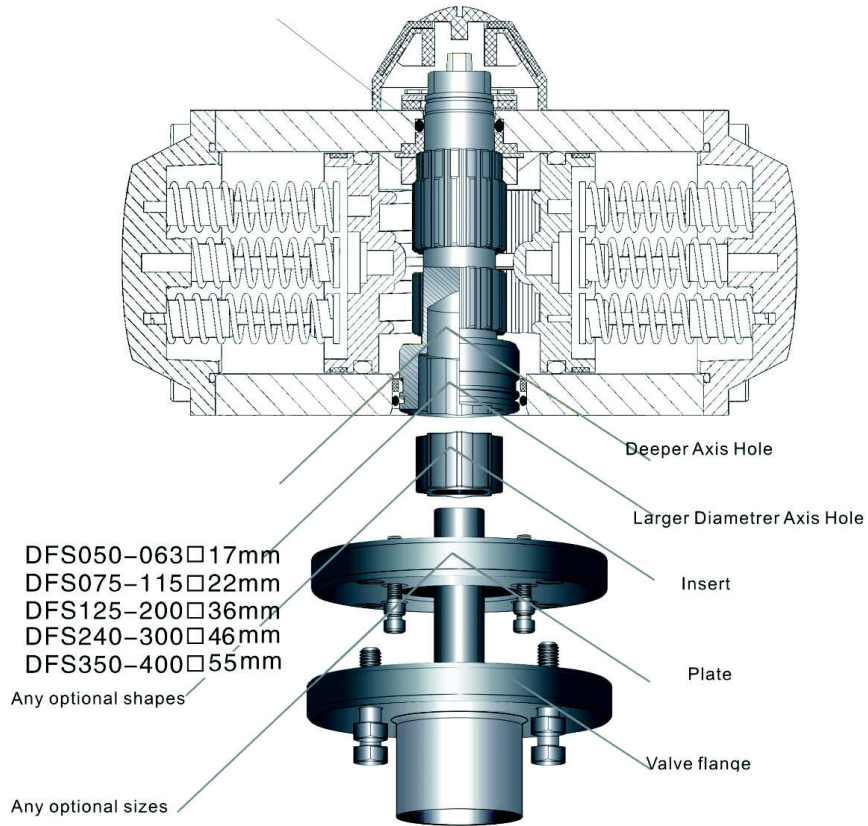


**Brook Valves**

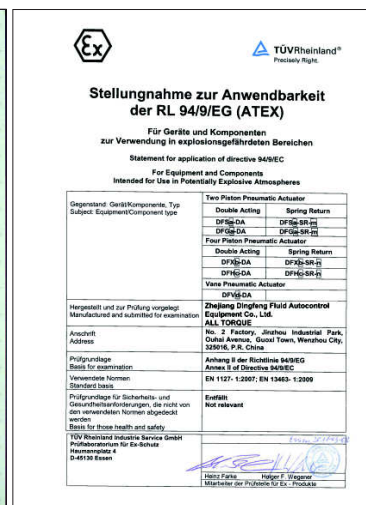


Two Piston Pneumatic Actuator  
Epoxy Polyester Coated

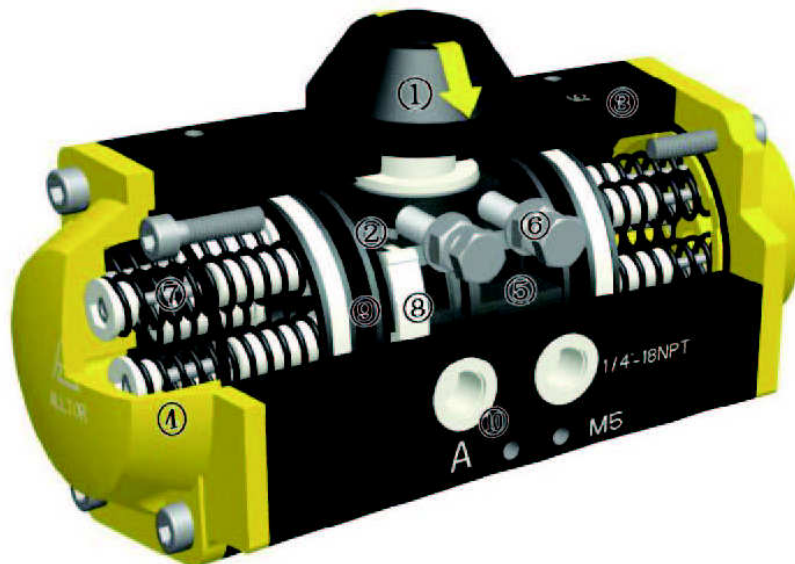
No ring groove on the top of drive shaft



Patent No: ZL200930382594.7



## Design & Construction



### 1. Indicator

Indicator according to VID/VIE3845 is convenient for mounting accessories such as limit switch box, Positioner and etc.

### 2. Pinion

The design of the nickel-plated alloy steel integrated forging pinion drive is according the NAMUR,ISO5211 and DIN3337 standards. Special standard are available upon request.

### 3. Actuator Body

High quality aluminum alloy extrusion formed. The surface has been treated by anodized hardening followed by epoxy polyester coating. Other surface treatments are available e.g. PTFE and Nickel plating as well as other colour coatings on request.

### 4. End Cap

The surface has been treated by anodized hardening followed by epoxy polyester coating. Other surface treatments are available on request e.g. PTFE and Nickel plating as well as other colours on request.

### 5. Piston

Manufactured from Die-cast aluminum and treated by anodized hardening process. Symmetric mounting of the piston helps to ensure easy maintenance. Reverse action requirements can be achieved by inverting the pistons.

### 6. Adjusting Bolt

The two independent adjustment bolts can adjust opening and closing of the mounted valve within  $\pm 5^\circ$ .

### 7. Spring

Preloaded high grade springs with surface epoxy resin painted, which can be demounted conveniently to satisfy different requirements of torque by changing quantity of springs.

### 8. Piston Ring

Manufactured from low friction long life material POM. Can be easily changed for maintenance purposes.

### 9. O-rings

Standard NBR rubber O-rings provide trouble-free operation at standard temperature ranges. For other temperature requirements relevant materials can be offered on request.

### 10. Air Connection

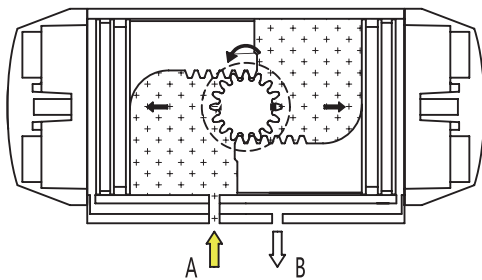
Conforms to NAMUR standards

11. All stop parts are manufactured from SS304.

## Operations

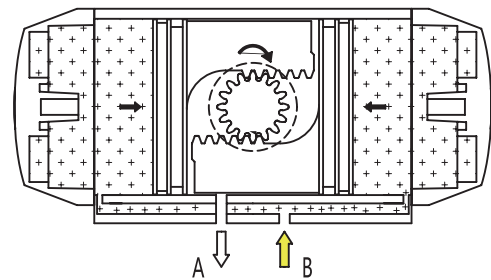
The standard rotation is clockwise to close; counter-clockwise rotation is obtained when port A is pressurized.

### Double Acting Operation Function (Standard Rotation) Top View



CCW

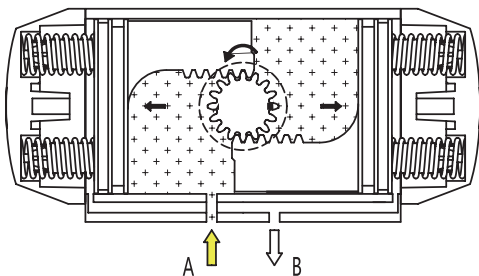
Air supplied to Port A forces the pistons apart and toward end positions, with exhaust air exiting at Port B, a counter-clockwise rotation is obtained.



CW

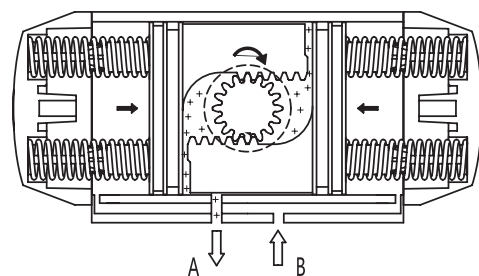
Air supplied to Port B forces the pistons together with exhaust air exiting at Port A, a clockwise rotation is obtained.

### Single Acting Operation Function (Standard Rotation) Top View



CCW

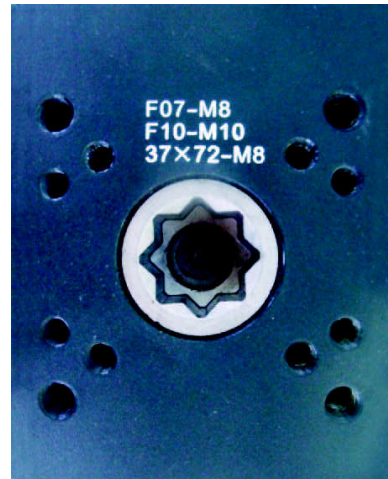
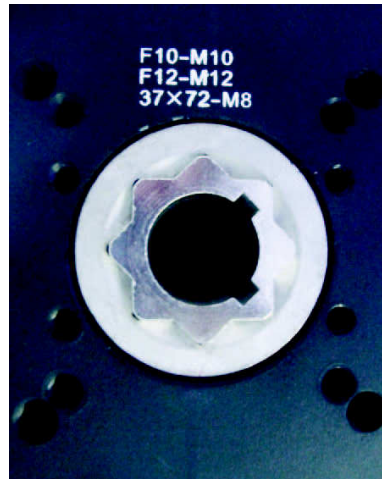
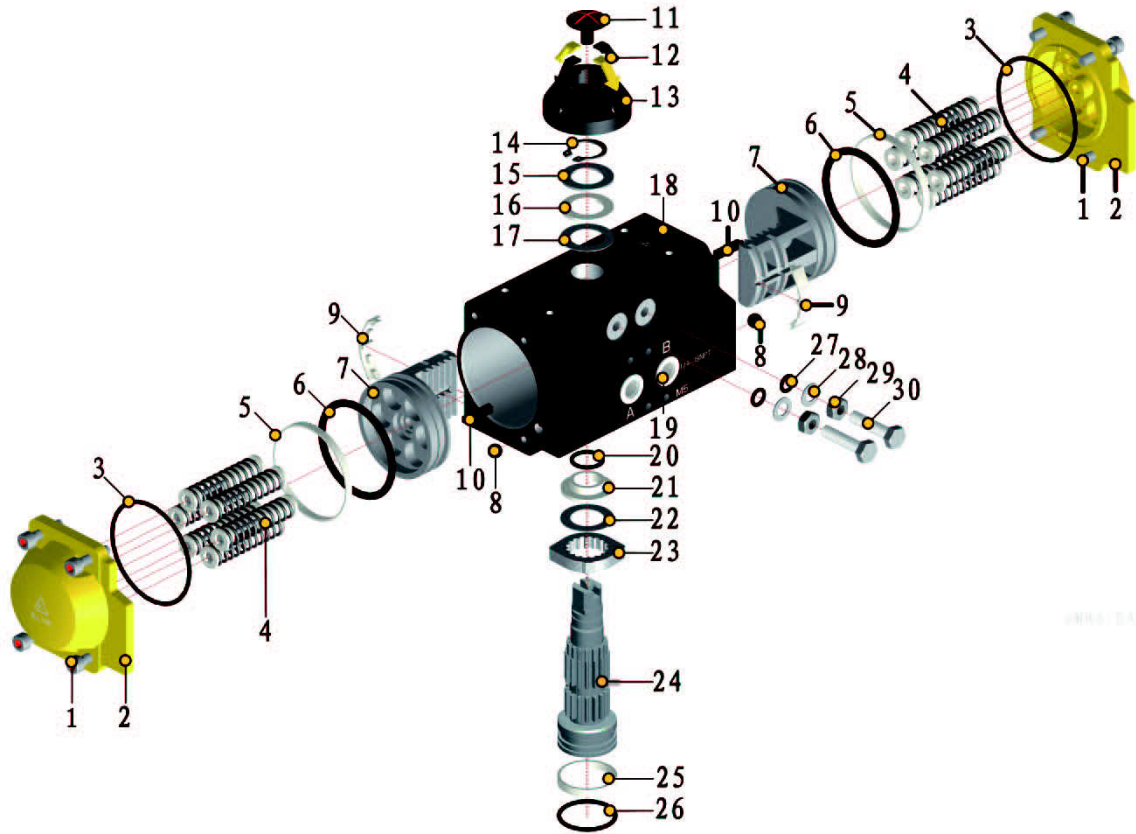
Air supplied to Port A forces the pistons apart and toward end positions, compressing the springs with exhaust air exiting at Port B, a counter-clockwise rotation is obtained.



CW

On loss of air pressure (air or electric failure) at port A allows the springs to force the pistons to the centre position with exhaust air exiting at Port A, a clockwise rotation is obtained.

## Explode View



Compared with other ordinary actuators, we drill four extra thread holes on the bottom of actuator. Using our connecting plates, it can be connected with all kinds of international standard valve flanges fairly.

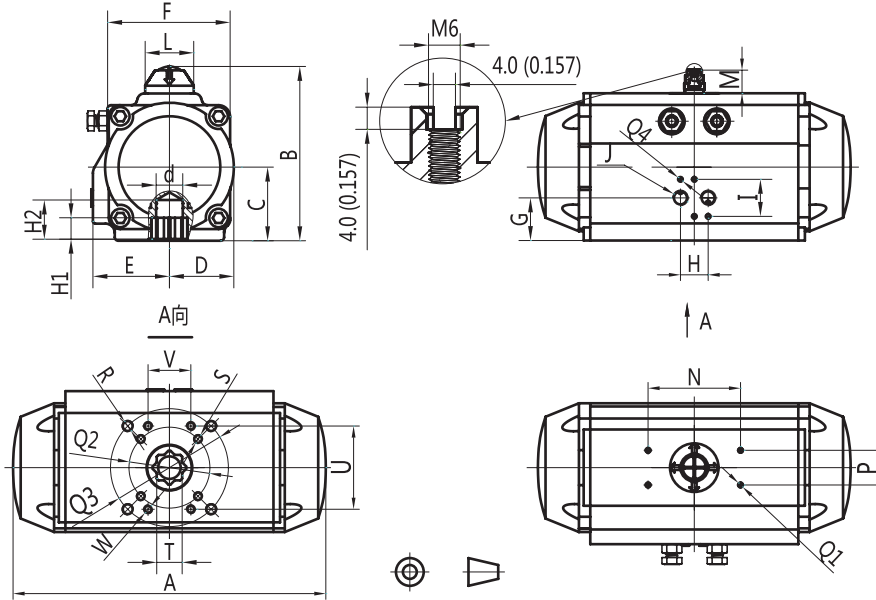
The large diameter hole of the output pinion on the bottom makes our actuator suitable for all kinds of valve stems and connecting keys by using our insert. Efficient and economic.

Extra deep hole for pinion shaft on the bottom of actuator is suitable for any long size valve stem.

## Parts List

No.	Part Description	Q.TY	Materials	Surface Treated	Optional Material
1	Socket Head Screw	8	SUS 304		
2	End Cap	2	AL380 ≤ DFS 200 WCB ≥ DFS 240	Anode Hardening +Polyester Coating	CF8/CF8M
3	"O"ring ( Cylinder Head )	2	NBR Rubber		Viton / Silicone Rubber
4	Spring	2-12	Spring Steel	Epoxy resin Coating	
5	Piston Ring	2	POM		
6	"O"Ring (Piston)	2	NBR Rubber		Viton / Silicone Rubber
7	Piston	2	AL380	Anode Hardening	
8	Stopper	2	NBR Rubber		Viton / Silicone Rubber
9	Guide Ring	2	PA6		
10	Guide Block	2	PA6		
11	Indicator Bolt	1	ABS		
12	Indicator Arrowhead	4	ABS		
13	Indicator	1	ABS		
14	Snap Ring	1	Stainless Steel		
15	Washer	1	SUS 304		
16	Disc Bearing	1	POM		
17	Washer	1	SUS 304		
18	Body	1	AL6063-T6	Anode Hardening +Polyester Coating	CF8/CF8M
19	Plug	2	PVC		
20	"O"Ring (Pinion Top)	1	NBR Rubber		Viton / Silicone Rubber
21	Bearing (pinion Top)	1	POM		
22	Disc Bearing	1	SUS 304		
23	Stroke Adjustment Stop	1	SAE 1020	Nickel Plated	CF8/CF8M
24	Pinion Shaft	1	SAE 1045	Nickel Plated	SUS304/SUS316
25	Bearing(Pinion Bottom)	1	POM		
26	"O" ring (pinion bottom )	1	NBR Rubber		Viton / Silicone Rubber
27	"O"Ring (Adjusting Bolt)	2	NBR Rubber		Viton / Silicone Rubber
28	Metal Washer	2	SUS 304		
29	Nut	2	SUS 304		
30	Adjusting Bolt	2	SUS 304		

## (DFS032-DFS400) Installation Size(DFS032-DFS400)



Metric Unit mm

Model Size	DFS032	DFS040	DFS050	DFS063	DFS075	DFS085	DFS100	DFS115	DFS125	DFS145	DFS160	DFS180	DFS200	DFS240	DFS265	DFS300	DFS350	DFS400
A	82	109	148	159	213	249	271	315	346	412	443	492	547	614	729	839	900	1158
B	72	75	91	107	124	138	149	175	190	210	230	254	277	346	388	408	460	517
C	31	28	34	42	51	58	64	73	79	88	98	110	122	146	167	178	205	234
D	20.5	27	29	36	44	49	56	64	69	80	88	99	109	131	147	162	189	260
E	30	33	41	47	53	57	66	77	82	92	98	106	112	131	147	173	195	260
F	50.5	60	53	66	82	92	106	121	130	149	160	180	198	231	254	290	336	331
G	26	28	26	30	29	32	37	37	46	53	52	60	66	70	90	85	92	233
H	24	24	24	24	24	24	24	24	24	24	24	24	24	40	40	40	40	40
I	32	32	32	32	32	32	32	32	32	32	32	32	32	45	45	45	45	45
J	NPT1/8"	NPT1/8"	NPT1/4"	NPT1/4"	NPT1/4"	NPT1/4"	NPT1/4"	NPT1/4"	NPT1/4"	NPT1/4"	NPT1/4"	NPT1/4"	NPT1/4"	NPT3/8"	NPT3/8"	NPT1/2"	NPT1/2"	NPT1/2"
L	φ30	φ30	φ40	φ40	φ40	φ40	φ40	φ60	φ60	φ60	φ60	φ80	φ80	φ80	φ80	φ80	φ75	φ75
M	20	20	20	20	20	20	20	30	30	30	30	30	30	50	50	50	50	50
N	25.5	41	80	80	80	80	80	80	80	80	80	130	130	130	130	130	130	130
P	25.5	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Q1	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5
Q2	φ36	φ36	φ42	φ50	φ50	φ50	φ70	φ70	φ102	φ102	φ102	φ102	φ102	φ125	-	-	-	-
Q3	-	φ50	-	-	φ70	φ70	φ102	φ102	-	φ125	φ125	φ140	φ140	φ165	φ165	φ165	φ254	φ254
Q4	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5	M6	M6	M6	M6	M6
R	-	4-M6	-	-	4-M8	4-M8	4-M10	4-M10	-	4-M12	4-M12	4-M16	4-M16	4-M20	4-M20	4-M20	8-M16	8-M16
S	4-M5	4-M5	4-M5	4-M6	4-M6	4-M6	4-M8	4-M8	4-M10	4-M10	4-M10	4-M10	4-M10	4-M12	-	-	-	-
T	9	9	17	17	22	22	22	22	36	36	36	36	36	46	46	46	55	55
H1	11	11	12	16	19	19	23	23	29	29	29	42	42	50	50	50	60	60
d	-	-	φ14.3	φ14.3	φ19.5	φ19.5	φ23	φ23	φ36	φ36	φ36	φ38	φ38	φ48	φ48	φ48	φ55	φ55
H2	-	-	32	34	34	34	48	48	65	65	65	92	92	92	92	92	100	100
U	-	-	-	-	-	-	72	72	72	72	72	99	99	-	-	-	-	-
V	-	-	-	-	-	-	37	37	37	37	37	53	53	-	-	-	-	-
W	-	-	-	-	-	-	M8	M8	M8	M8	M8	M10	M10	-	-	-	-	-

## Weight & Air Consumption

Metric Unit mm

Data Model	Body Diameter	Air Consumption Per Stroke Actual Volume/L		Opening Time DA	Closing Time DA	Approximate Weight-DA
	Φ( mm)	CCW (L)	CW (L)	S (sec.)	S (sec.)	kg
DFS032	32	0.015	0.034	0.13	0.14	0.322
DFS040	40	0.032	0.068	0.14	0.16	0.695
DFS050	50	0.08	0.13	0.17	0.19	1.08
DFS063	63	0.15	0.25	0.19	0.22	1.55
DFS075	75	0.30	0.48	0.23	0.27	2.75
DFS085	88	0.50	0.73	0.33	0.35	3.78
DFS100	100	0.75	1.08	0.42	0.48	5.3
DFS115	115	1.19	1.8	0.72	0.93	8.4
DFS125	125	1.55	2.18	0.84	1.09	9.93
DFS145	145	2.40	3.55	1.32	1.42	14.1
DFS160	160	3.20	4.72	1.6	2.0	18.35
DFS180	180	4.30	6.80	2	2.4	25
DFS200	200	5.87	9.53	2.7	3.5	35
DFS240	240	10	15	3.5	4.5	63
DFS265	270	15	23	4.5	5.0	79
DFS300	300	21.1	30.5	8.8	12.7	135.8
DFS350	350	30.8	44.4	13	19	234.3
DFS400	400	48.3	69.6	20	29	338

Imperial Unit Inch

Data Model	Body Diameter	Air Consumption Per Stroke Actual Volume/L		Opening Time DA	Closing Time DA	Approximate Weight-DA
	Φ( In)	CCW (L)	CW (L)	S (sec.)	S (sec.)	lb
DFS032	1.26	0.015	0.034	0.13	0.14	0.71
DFS040	1.57	0.032	0.068	0.14	0.16	1.53
DFS050	1.97	0.08	0.13	0.17	0.19	2.38
DFS063	2.48	0.15	0.25	0.19	0.22	3.42
DFS075	2.95	0.30	0.48	0.23	0.27	6.06
DFS085	3.46	0.50	0.73	0.33	0.35	8.33
DFS100	3.94	0.75	1.08	0.42	0.48	11.68
DFS115	4.53	1.19	1.8	0.72	0.93	18.5
DFS125	4.92	1.55	2.18	0.84	1.09	21.89
DFS145	5.71	2.40	3.55	1.32	1.42	31.08
DFS160	6.30	3.20	4.72	1.6	2.0	40.45
DFS180	7.09	4.30	6.80	2	2.4	55.12
DFS200	7.87	5.87	9.53	2.7	3.5	77.16
DFS240	9.45	10	15	3.5	4.5	138.89
DFS265	10.63	15	23	4.5	5.0	174.16
DFS300	11.81	21.1	30.5	8.8	12.7	299.39
DFS350	13.780	30.8	44.4	13	19	516.54
DFS400	15.75	48.3	69.6	20	29	745.16

☒ The above indicated moving time of the actuator, are obtained in the following testcons:

- (1) Room temperature
- (2) Actuator stroke 90°
- (3) Solenoid valve with orifice of 4mm and flow capacity QN 400L/min.
- (4) Inside pipe diameter 5mm
- (5) Medium clean air
- (6) Air supply pressure 5.5 bar ( 79.75psi )
- (7) Actuator without external resistance load

1. Top mounting connection is in line with VDI/VDE3845 standards, permitting direct installation of accessories such as positioner or limit switch box.
2. Bottom mounting connection is in line with ISO5211 and DIN3337 standards.
3. Air supply connection is in line with VDI/VDE3845 and NAMUR conveniently.



## Output Torque of Double Acting Actuator(metric)

metric unit N.m

Output Torque of Double Acting Actuator							
Air Pressure Model	3.0bar	4.0bar	5.0bar	5.5bar	6.0bar	7.0bar	8.0bar
DFS032	3.2	4.5	5.9	6.6	7.2	8.5	9.8
DFS040	5	7	9	10	11	13	15
DFS050	9.5	12	15.8	17.5	19	23	26.5
DFS063	16	21.5	28.7	31	34	39	46
DFS075	34	47	58.5	63	69	80.5	91
DFS085	53	70	88	98	106	124	145
DFS100	76.5	104	127	142	155	184	214
DFS115	129	170	215	236	258	301	344
DFS125	163	210	268	300	328	385	442
DFS145	230	315	420	462	504	590	690
DFS160	350	450	560	625	675	788	910
DFS180	445	607	760	848	910	1064	1237
DFS200	625	840	1058	1165	1260	1462	1681
DFS240	1070	1435	1785	1970	2150	2508	2865
DFS265	1745	2320	2900	3200	3500	4080	4670
DFS300	2195	2927	3681	4025	4391	5122	5854
DFS350	3205	4274	5369	5876	6411	7479	8547
DFS400	5024	6698	8415	9210	10048	11722	13397

## Output Torque of Spring Return Actuator(metric)

metric unit N.m

Size Model	Springs Qty	Output Torque of Spring Return Actuator														Spring Return	
		3.0bar		4.0bar		5.0bar		5.5bar		6.0bar		7.0bar		8.0bar		0°	90°
		0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°		
DFS 040	2					6.0	4.0	7.0	5.0	8.0	6.0	10.0	8.0	12.0	10.0	3.0	5.0
	4									6.0	2.0	8.0	4.0	10.0	6.0	5.0	9.0
DFS 050	5	6.5	4.8	9.0	7.3	12.8	11.1	14.5	12.8	16.0	14.3	20.0	18.3	23.5	21.8	3.0	4.7
	6	5.7	3.8	8.2	6.3	12.0	10.1	13.7	11.8	15.2	13.3	19.2	17.3	22.7	20.8	3.8	5.7
	7	5.0	2.8	7.5	5.3	11.3	9.1	13.0	10.8	14.5	12.3	18.5	16.3	22.0	19.8	4.5	6.7
	8			6.7	4.2	10.5	8.0	12.2	9.7	13.7	11.2	17.7	15.2	21.2	18.7	5.3	7.8
	9			6.0	3.3	9.8	7.1	11.5	8.8	13.0	10.3	17.0	14.3	20.5	17.8	6.0	8.7
	10					9.1	6.2	10.8	7.9	12.3	9.4	16.3	13.4	19.8	16.9	6.7	9.6
	11					8.3	5.1	10.0	6.8	11.5	8.3	15.5	12.3	19.0	15.8	7.5	10.7
	12					7.5	4.0	9.2	5.7	10.7	7.2	14.7	11.2	18.2	14.7	8.3	11.8
DFS 063	5	10.3	7.4	15.8	12.9	23.0	20.1	25.3	22.4	28.3	25.4	33.3	30.4	40.3	37.4	5.7	8.6
	6	9.2	5.6	14.7	11.1	21.9	18.3	24.2	20.6	27.2	23.6	32.2	28.6	39.2	35.6	6.8	10.4
	7	8.1	3.8	13.6	9.3	20.8	16.5	23.1	18.8	26.1	21.8	31.1	26.8	38.1	33.8	7.9	12.2
	8			12.4	7.7	19.6	14.9	21.9	17.2	24.9	20.2	29.9	25.2	36.9	32.2	9.1	13.8
	9			11.2	5.9	18.4	13.1	20.7	15.4	23.7	18.4	28.7	23.4	35.7	30.4	10.3	15.6
	10			10.0	4.1	17.2	11.3	19.5	13.6	22.5	16.6	27.5	21.6	34.5	28.6	11.5	17.4
	11					16.1	9.5	18.4	11.8	21.4	14.8	26.4	19.8	33.4	26.8	12.6	19.2
	12					15.0	7.8	17.3	10.1	20.3	13.1	25.3	18.1	32.3	25.1	13.7	20.9
DFS 075	5	22.5	16.0	35.5	29.0	47.0	40.5	51.5	45.0	57.5	51.0	69.0	62.5	79.5	73.0	11.5	18.0
	6	20.5	12.5	33.5	25.5	45.0	37.0	49.5	41.5	55.5	47.5	67.0	59.0	77.5	69.5	13.5	21.5
	7	18.3	9.0	31.3	22.0	42.8	33.5	47.3	38.0	53.3	44.0	64.8	55.5	75.3	66.0	15.7	25.0
	8			29.0	18.5	40.5	30.0	45.0	34.5	51.0	40.5	62.5	52.0	73.0	62.5	18.0	28.5
	9			26.9	15.0	38.4	26.5	42.9	31.0	48.9	37.0	60.4	48.5	70.9	59.0	20.1	32.0
	10			24.7	11.5	36.2	23.0	40.7	27.5	46.7	33.5	58.2	45.0	68.7	55.5	22.3	35.5
	11					34.0	19.5	38.5	24.0	44.5	30.0	56.0	41.5	66.5	52.0	24.5	39.0
	12					31.8	16.0	36.3	20.5	42.3	26.5	53.8	38.0	64.3	48.5	26.7	42.5
DFS 085	5	34.2	23.0	51.2	40.0	69.2	58.0	79.2	68.0	87.2	76.0	105.2	94.0	126.2	115.0	18.8	30.0
	6	30.5	17.2	47.5	34.2	65.5	52.2	75.5	62.2	83.5	70.2	101.5	88.2	122.5	109.2	22.5	35.8
	7	26.8	11.4	43.8	28.4	61.8	46.4	71.8	56.4	79.8	64.4	97.8	82.4	118.8	103.4	26.2	41.6
	8			40.2	22.6	58.2	40.6	68.2	50.6	76.2	58.6	94.2	76.6	115.2	97.6	29.8	47.4
	9			36.6	16.8	54.6	34.8	64.6	44.8	72.6	52.8	90.6	70.8	111.6	91.8	33.4	53.2
	10			32.9	11.0	50.9	29.0	60.9	39.0	68.9	47.0	86.9	65.0	107.9	86.0	37.1	59.0
	11					47.2	23.2	57.2	33.2	65.2	41.2	83.2	59.2	104.2	80.2	40.8	64.8
	12					43.5	17.4	53.5	27.4	61.5	35.4	79.5	53.4	100.5	74.4	44.5	70.6
DFS 100	5	51.4	37.5	78.9	65.0	101.9	88.0	116.9	103.0	129.9	116.0	158.9	145.0	188.9	175.0	25.1	39.0
	6	46.3	29.6	73.8	57.1	96.8	80.1	111.8	95.1	124.8	108.1	153.8	137.1	183.8	167.1	30.2	46.9
	7	41.2	21.7	68.7	49.2	91.7	72.2	106.7	87.2	119.7	100.2	148.7	129.2	178.7	159.2	35.3	54.8
	8			63.6	41.3	86.6	64.3	101.6	79.3	114.6	92.3	143.6	121.3	173.6	151.3	40.4	62.7
	9			58.5	33.4	81.5	56.4	96.5	71.4	109.5	84.4	138.5	113.4	168.5	143.4	45.5	70.6
	10			53.5	25.6	76.5	48.6	91.5	63.6	104.5	76.6	133.5	105.6	163.5	135.6	50.5	78.4
	11					71.4	40.7	86.4	55.7	99.4	68.7	128.4	97.7	158.4	127.7	55.6	86.3
	12					66.2	32.8	81.2	47.8	94.2	60.8	123.2	89.8	153.2	119.8	60.8	94.2

## Output Torque of Spring Return Actuator(metric)

metric unit N.m

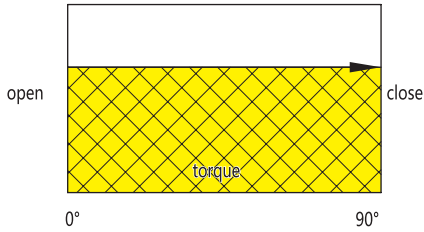
Size Model	Spring Quantity	Output Torque of Spring Return Actuator														Spring Return	
		3.0bar		4.0bar		5.0bar		5.5bar		6.0bar		7.0bar		8.0bar		0°	90°
		0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°		
DFS 115	5	88	63	131	106	174	149	195	170	217	192	260	235	303	279	41	66
	6	80	50	123	93	166	136	187	158	209	180	252	222	295	266	49	79
	7	72	37	115	80	158	123	179	145	200	166	244	209	287	252	57	92
	8			106	67	149	110	171	132	192	153	235	196	279	239	66	105
	9			98	54	141	97	163	118	184	140	227	183	270	226	74	118
	10					133	84	154	105	176	127	219	170	262	213	82	131
	11					125	71	146	92	168	114	211	157	254	200	90	144
12							138	79	159	101	202	144	245	187	98	157	
DFS 125	5	112	82	159	129	217	187	249	219	277	247	334	304	391	361	51	81
	6	102	65	149	112	207	170	239	202	266.5	230	323.5	287	380.5	344	61.5	98
	7	91	49	138	96	196	154	228	186	256	214	313	271	370	328	72	114
	8			127	79	185	137	217	169	245	197	302	254	359	311	83	131
	9			117	62	175	120	207	152	234.5	180	291.5	237	348.5	294	93.5	148
	10			106	45	164	103	196	135	224	163	281	220	338	277	104	165
	11					154	87	186	119	213.5	147	270.5	204	327.5	261	114.5	181
12					143	70	175	102	203	130	259.5	187	316.5	244	125.5	198	
DFS 145	5	149	103	234	188	339	293	381	335	450	404	509	463	609	563	81	127
	6	132	77	217	162	322	267	364	309	433	378	492	437	592	537	98	153
	7	115	51	200	136	305	241	347	283	416	352	475	411	575	511	115	179
	8			184	110	289	215	331	257	400	326	459	385	559	485	131	205
	9			167	85	272	190	314	232	383	301	442	360	542	460	148	230
	10			150	59	255	164	297	206	366	275	425	334	525	434	165	256
	11					239	138	281	180	350	249	409	308	509	408	181	282
12					223	112	265	154	334	223	393	282	493	382	197	308	
DFS 160	5	240	185	340	285	450	395	515	460	565	510	678	623	800	745	110	165
	6	217	152	317	252	427	362	492	427	542	477	655	590	777	712	133	198
	7	194	118	294	218	404	328	469	393	519	443	632	556	754	678	156	232
	8			271	185	381	295	446	360	496	410	609	523	731	645	179	265
	9			249	151	359	261	424	326	474	376	587	489	709	611	201	299
	10			226	118	336	228	401	293	451	343	564	456	686	578	224	332
	11					313	194	378	259	428	309	541	422	663	544	247	366
12					291	161	356	226	406	276	519	389	641	511	269	399	
DFS 180	5	289	206	451	368	604	521	692	609	754	671	908	825	1081	998	156	239
	6	257	159	419	321	572	474	660	562	722	624	876	778	1049	951	188	286
	7	225	112	387	274	540	427	628	515	690	577	844	731	1017	904	220	333
	8			355	226	508	379	596	467	658	529	812	683	985	856	252	381
	9			324	179	477	332	565	420	627	482	781	636	954	809	283	428
	10			292	132	445	285	533	373	595	435	749	589	922	762	315	475
	11					414	238	502	326	564	388	718	542	891	715	346	522
12					382	191	470	279	532	341	686	495	859	668	378	569	
DFS 200	5	409	307	624	522	842	740	949	847	1044	942	1246	1144	1465	1363	216	318
	6	367	244	582	459	800	677	907	784	1002	879	1204	1081	1423	1300	258	381
	7	325	181	540	396	758	614	865	721	960	816	1162	1018	1381	1237	300	444
	8			498	334	716	552	823	659	918	754	1120	956	1339	1175	342	506
	9			455	272	673	490	780	597	875	692	1077	894	1296	1113	385	568
	10			412	209	630	427	737	534	832	629	1034	831	1253	1050	428	631
	11					588	365	695	472	790	567	992	769	1211	988	470	693
12					545	302	652	409	747	504	949	706	1168	925	513	756	

## Output Torque of Spring Return Actuator(metric)

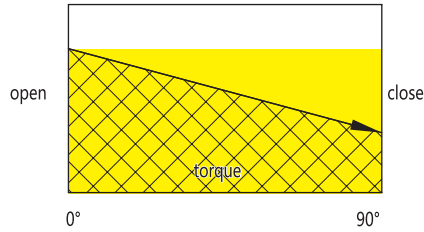
metric unit N.m

Size Model	Springs Qty	Output Torque of Spring Return Actuator														Spring Return	
		3.0bar		4.0bar		5.0bar		5.5bar		6.0bar		7.0bar		8.0bar		0°	90°
		0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°		
DFS 240	5	705	543	1070	908	1420	1258	1605	1443	1785	1623	2143	1981	2500	2338	365	527
	6	631	438	996	803	1346	1153	1531	1338	1711	1518	2069	1876	2426	2233	439	632
	7	558	331	923	696	1273	1046	1458	1231	1638	1413	1995	1772	2351	2128	512	739
	8			845	590	1199	940	1384	1125	1564	1308	1922	1667	2277	2023	586	845
	9			778	486	1128	836	1313	1021	1493	1203	1848	1563	2202	1918	657	949
	10			704	383	1054	733	1239	918	1419	1098	1773	1458	2129	1812	731	1052
	11					980	627	1165	812	1345	994	1700	1352	2055	1708	805	1158
	12					906	518	1091	703	1271	890	1625	1248	1980	1602	879	1267
DFS 265	5	1203	945	1778	1520	2358	2100	2658	2400	2958	2700	3538	3280	4128	3870	542	800
	6	1092	790	1671	1363	2249	1940	2549	2240	2849	2540	3429	3120	4019	3710	653	955
	7	985	629	1564	1206	2140	1780	2449	2080	2470	2380	3320	2960	3910	3550	760	1116
	8			1457	1045	2031	1620	2330	1920	2631	2220	3211	2800	3801	3390	865	1275
	9			1350	886	1922	1460	2222	1760	2522	2060	3102	2640	3682	3230	980	1440
	10			1234	724	1813	1300	2113	1600	2413	1900	2993	2480	3583	3070	1086	1596
	11					1704	1140	2004	1440	2304	1740	2884	2320	3474	2910	1193	1754
	12					1600	990	1895	1280	2195	1580	2775	2160	3365	2750	1300	1910
DFS 300	5	1457	1088	2189	1820	2943	2574	3287	2918	3653	3284	4384	4015	5116	4747	738	1107
	6	1310	868	2042	1600	2796	2354	3140	2698	3506	3064	4237	3795	4969	4527	885	1327
	7	1163	647	1895	1379	2649	2133	2993	2477	3359	2843	4090	3574	4822	4306	1032	1548
	8			1748	1158	2502	1912	2846	2256	3212	2622	3943	3353	4675	4085	1179	1769
	9			1600	937	2354	1691	2698	2035	3064	2401	3795	3132	4527	3864	1327	1990
	10			1453	716	2207	1470	2551	1814	2917	2180	3648	2911	4380	3643	1474	2211
	11					2060	1249	2404	1593	2770	1959	3501	2690	4233	3422	1621	2432
	12							2256	1372	2622	1738	3353	2469	4085	3201	1769	2653
DFS 350	5	2129	1591	3198	2660	4293	3755	4800	4262	5335	4797	6403	5865	7471	6933	1076	1614
	6	1914	1269	2983	2338	4078	3433	4585	3940	5120	4475	6188	5543	7256	6611	1291	1936
	7	1700	947	2769	2016	3864	3111	4371	3618	4906	4153	5974	5221	7042	6289	1505	2258
	8			2554	1694	3649	2789	4156	3296	4691	3831	5759	4899	6827	5967	1720	2580
	9			2339	1372	3434	2467	3941	2974	4476	3509	5544	4577	6612	5645	1935	2902
	10			2124	1050	3219	2145	3726	2652	4261	3187	5329	4255	6397	5323	2150	3224
	11					3005	1823	3512	2330	4047	2865	5115	3933	6183	5001	2364	3546
	12							3297	2007	3832	2542	4900	3610	5968	4678	2579	3869
DFS 400	5	3341	2499	5015	4173	6732	5890	7527	6685	8365	7523	10039	9197	11714	10872	1683	2525
	6	3004	1994	4678	3668	6395	5385	7190	6180	8028	7018	9702	8692	11377	10367	2020	3030
	7	2668	1489	4342	3163	6059	4880	6854	5675	7692	6513	9366	8187	11041	9862	2356	3535
	8			4005	2658	5722	4375	6517	5170	7355	6008	9029	7682	10704	9357	2693	4040
	9			3669	2153	5386	3870	6181	4665	7019	5503	8693	7177	10368	8852	3029	4545
	10			3332	1648	5049	3365	5844	4160	6682	4998	8356	6672	10031	8347	3366	5050
	11					4712	2860	5507	3655	6345	4493	8019	6167	9694	7842	3703	5555
	12							5171	3150	6009	3988	7683	5662	9358	7337	4039	6060

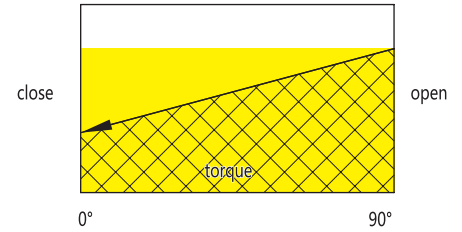
Output Torque of Double Acting Actuator



Output Torque of Spring Return Actuator



with air



Out of air

### Service Conditions to Consider

**1. Operating media:**

Dry or lubricated air, or inert gas, or non-corrosive gases that compatible with actuator inner parts and lubricant are available. The media temperature must 10% lower than ambient temperature at least, and the maximum particle diameter must less than 20μ.

**2. Air supply pressure:**

3 Bar (40 PSI) ~ 8 Bar (120 PSI)

**3. Operating temperature:**

- a. Standard: -20~ +80
- b. Low temperature: -40~ +80
- c. High temperature: -15~ +150

**4. Travel adjustment:**

Have adjustment range of ±5° for the rotating 90° .

**5. Lubricant:**

Use the lubricant that temperature range at -20 to +80. Select special lubricant when the operating condition is low temperature or high temperature.

### The Grade of Anticorrosion & Recommended Service Environment

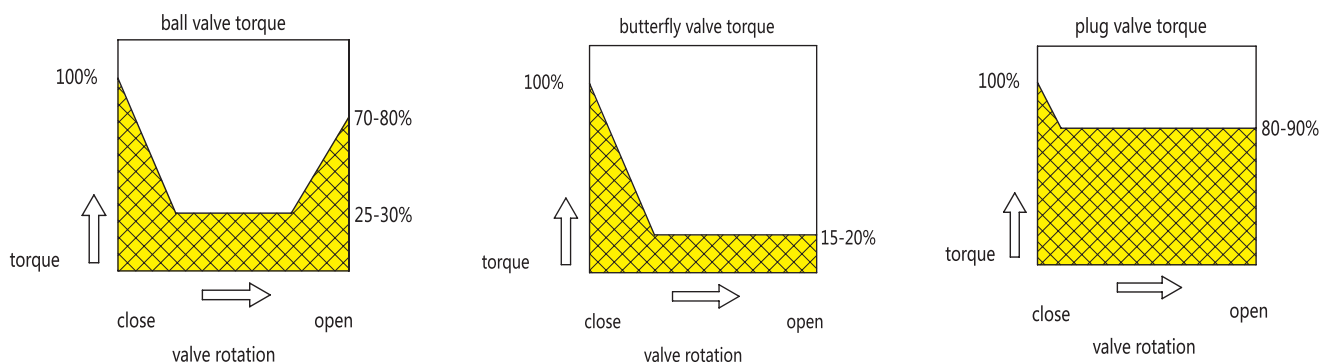
Parts	The Grade of Anticorrosion	
	A	B
Body	Anodise Hardening + Epoxy Polyester Coating	Stainless Steel CF8/CF8M
CAP	Anodise Hardening + Epoxy Polyester Coating	Stainless Steel CF8/CF8M
Drive Shaft	Carbon Steel Nickel Plated	Stainless Steel CF8/CF8M
Piston	Anodise Hardening	Stainless Steel CF8/CF8M
Service Condition	Normal Condition or Low Thickness Acid Environment	High Thickness Acid Environment

## Actuator Sizing Guide

### Actuation sizing data:

- ☒ This reference data are designed to help choose DFS actuator. Before installing the DFS actuator on valve, you must consider the following factors:
- ☒ The operating life of this actuator is 3 years or 1 million times.
- ☒ Non-metal parts should be replaced when the actuator is used over half a million times.
- ☒ The air pressure for the actuator.
- ☒ The operation torque of valve coupled with safety factor that manufacturer recommended (based on operations).
- ☒ The types of actuator, i.e. Double acting actuator and Spring return actuator, and its output torque under certain supply air.
- ☒ Actuator's direction of rotation and failure mode (failure open and close)
- ☒ It is very important to choose a correct actuator. For example, the stem will be over forced if the actuator is too big. Whereas, there will be not enough torque to operate valve if the actuator is too small. Usually, we consider the required torque to operate valves is from the frictions between metal parts of valve (such as ball and disc) and seals (body). According to the valves' working condition, a lot of factors can influence the torque, such as operating temperature, frequency of operation, management and pressure difference, delivery media (lubricated, dry, muddy).

Below quoted torque characteristics of three different types of 90° travel valves:



## Actuator Sizing Guide

### Ball Valve:

Ball valve construction concept is based essentially on a polished ball (include a through port) contained in two seats (upstream and downstream). The ball rotation allows the flow, or stops the flow through the valve. Differential Pressure between upstream and downstream pressures forces the ball against the downstream seat (floating ball). In this case, the valve torque is generated by the friction between ball and seat and also between stem and packing. As shown in the diagram , the highest torque point is when, in presence of pressure, the valve is in the closed position, and passes to the open position (breakaway torque).

### Butterfly Valve:

Butterfly valve construction concept is based essentially on a disc fixed on an axis, which in the closed position, is completely contained by the seat. The open position is obtained when, with a rotation, the disc (through its stem) becomes parallel to the flow. On the contrary, the closed position is obtained when the disc is perpendicular to the flow. In the case of the butterfly valve, the torque is generated by the friction between the disc and the seat, by the stem packing and also by the differential pressure that forces on the disc. The highest torque point, as shown in the diagram, is in the closed position, and only after a small rotation it is considerably reduced.

### Plug Valve:

The construction principle of the plug valve is basically according to the plug sealed in the conical cock body. There is a channel at a direction of the plug. Along with plug screws in the valve, the valve will open or close. The operating torque is decided by the friction of the valve seat and the plug during the open and close process and is often not influenced by the fluid's pressure. As shown in the picture. The torque is maximal when the valve closes. As without the influence of the pressure, the superior torque will be kept at the following operation.

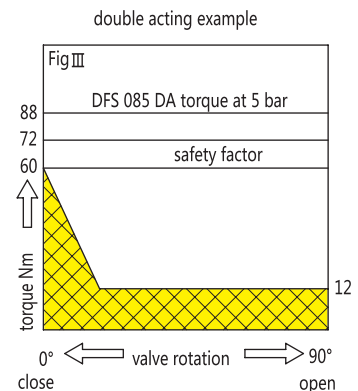
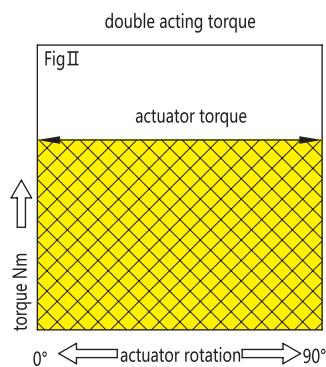
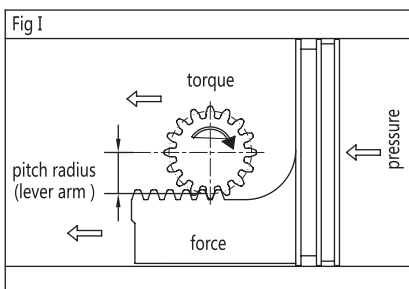
## Actuator Sizing Guide

### Double Acting Actuation Guide:

The output torque of rack and pinion pneumatic actuator = piston pressure (air supply pressure) × pitch radius (lever of arm), as Fig. I. Besides, the friction resistance and efficiency are very high. As Fig. II, both of the output torque are linear when CCW or CW. The suggested safety factor for double acting actuators under normal working conditions is 15%-20%.

### Example (check the technical data sheet)

- ☒ Butterfly valve's output torque = 60NM
- ☒ Safety factor (20%) =  $60\text{NM} \times (1 + 20\%) = 72\text{NM}$
- ☒ Air supply pressure = 5 bar
- ☒ When air supply pressure is 5 Bar, the kind of DFS double acting actuator with output 72NM you need at least is DFS085 for this operation.





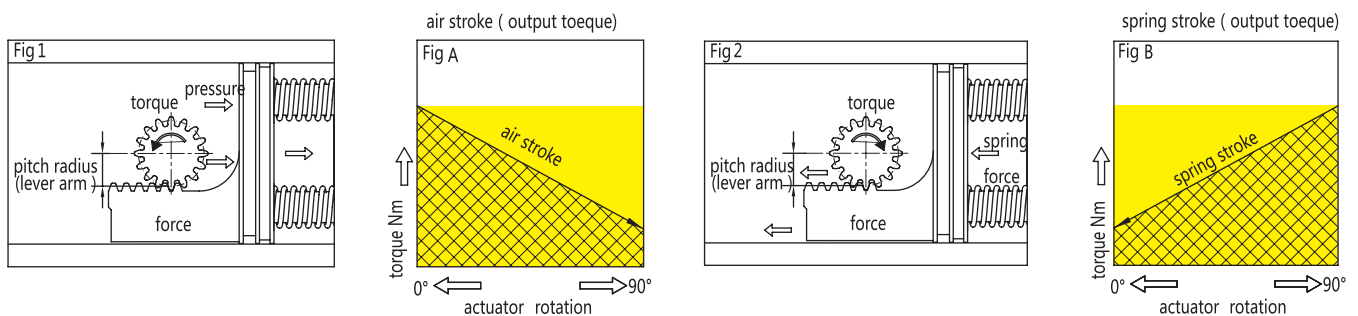
## Actuator Sizing Guide

### Spring Return Actuation Sizing Guide:

In the application of SR actuator, the output torque is coming from two different process of operation (Fig.1 and Fig.2). According to the travel position ( $0^\circ$  and  $90^\circ$ ), every operation gets two different torque. SR actuator's output torque=pressure (air or spring work on the piston)×pitch radius (lever of arm).

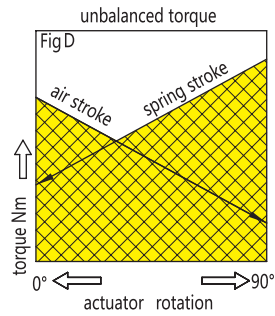
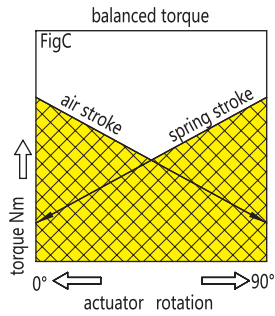
The first situation (Fig.1): output torque is coming from air supply pressure inside the Port 2 and squeezing the spring. It is known as "air travel output torque". In this situation, air supply pressure pressurized from  $0^\circ$  position to  $90^\circ$  position. As squeeze spring have a reaction force, torque is decreasing gradually from the starting  $0^\circ$  position to  $90^\circ$  position (Fig. A).

The second situation (Fig.2): the output torque is coming from the spring return forcing work on the piston when out of air. It is known as "spring travel output torque". In this situation, because of the comeback of spring, torque is decreasing gradually from the starting  $90^\circ$  position to  $0^\circ$  position (Fig. B).



In a word, DFS actuator is designed base on the fact that two situations get one balanced torque, i.e. the numbers of springs are the same as air supply pressure readings each side (4 bar, 4 springs each side), as shown in Fig. C. There are possibilities to get an unbalanced torque in every situation, as shown in Fig. D, by changing the number of springs and air supply pressure( such as six springs each side and 5.5 bar air supply pressure, and vice versa).

## Actuator Sizing Guide



In the application of SR actuator, there are two situations: out of air open or out of air close. The suggested safety factor for spring return actuators under normal working conditions is 20%-25%.

Example (check the technical data sheet):

- ☒ Springs closed (out of air)
- ☒ Ball valve's output torque=100NM
- ☒ Safety factor (20%)=100×(1+20%)=120NM
- ☒ Air supply pressure= 5 Bar

The selected actuator is DFS145, therefore it gets the following data (Fig.E):

- ☒ Spring stroke 0° =131NM
- ☒ Spring stroke 90° =205NM
- ☒ Air stroke 0° =289NM
- ☒ Air stroke 90° =215NM

