

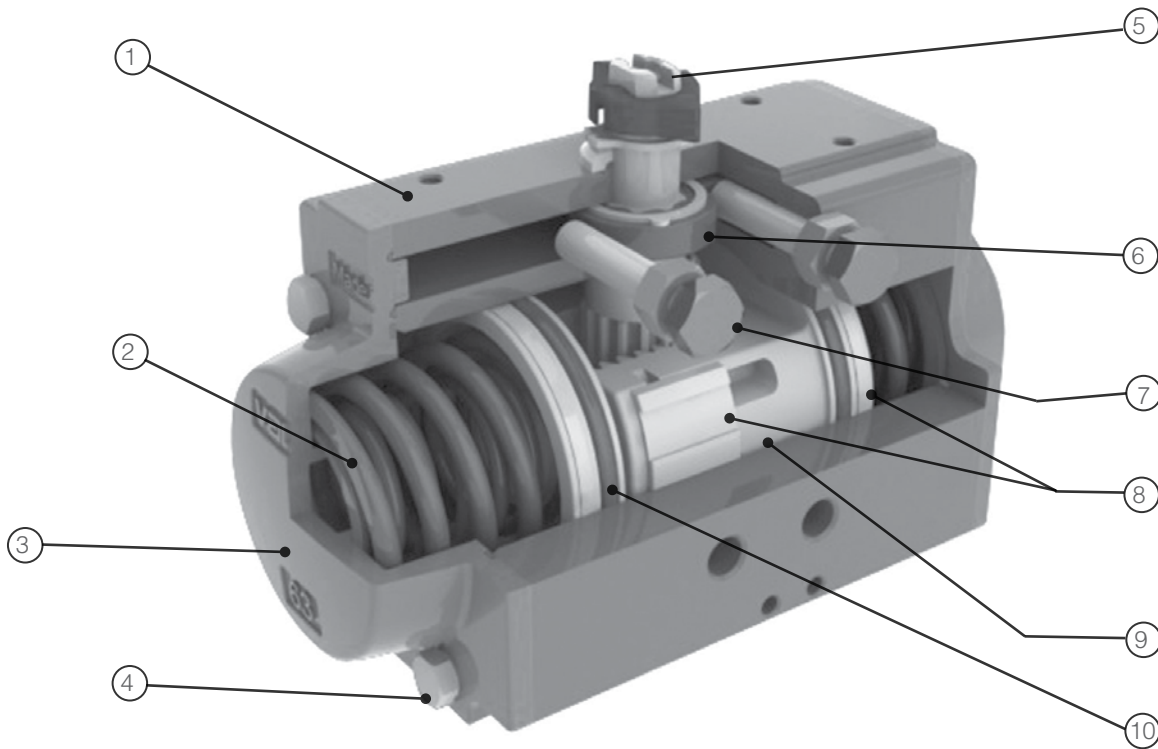
A full range of double acting and spring return actuators designed to NAMUR for air supply ports and top mounting, with ISO 5211 for base mounting patterns.

Features

- Dual adjustable open - close stops
- Anti-blowout pinion
- 1,000,000 cycle normal service life
- ISO / DIN Valve Interface
- NAMUR Accessory Mounting
- Long end cap bolts allow spring decompression

UT-DA Series
UT**-SR Series**

Quick Spec	
Product Scope	
Size Range	DA: 0A, 0, 1, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5 SR: 0, 1, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5
Operating Torque Range	DA: 71 to 44919 in-lb @ 80 psi SR: 55 to 16541 in-lb @ 80 psi
Operating Pressure	40 to 115 psig
Casing Pressure	150 psig
Temperature	(NBR standard) -4 to 175°F (opt. high temp. Viton) -4 to 302°F (opt. low temp. HBNR) -40 to 185°F
Media	Air dry or lubricated; noncorrosive gas
Rotation	100° (-5°CW to 5°CCW)
Materials	Casing: Aluminum UNI 6060 Shaft: Steel
Finish	Casing: Hard-coated anodized End Caps: Polyester powder coated
Design Standards	
Thread Design (Port)	ANSI B1.20.1
Mounting Flange (Valve)	ISO 5211
NAMUR Mounting (accessories)	VDI/VDE 3845
ATEX	Atmospheres Explosibles Directive 94/9/EC
PED	Pressure Equipment Directive 97/23/EC


1 Body manufactured from extruded aluminum UNI 6060

- Hard-coated anodized as standard finish Ra 1-1.5 micro-inch (Ra 45-50 micron)
- High corrosion resistance
- Special finishes epoxy-coated - optional
- Bore finished to high standard to ensure low friction and long life

2 Spring sets

- Standard coating painted
- High resistance and reliability
- Spring sets to suit different air pressure/torque requirements

3 Die cast aluminium end caps

- Polyester powder coated - standard
- Nickel plated - optional for corrosive environments

4 End cap screw

- Stainless steel standard

5 Pinon made in steel

- Nickel-plated standard to resist internal and external corrosion
- Stainless steel for corrosive environments- optional
- Anti-blowout design standard

6 Cam for limit switch adjustment 0° - 90°

- Stainless Steel
- Adjustment for open and close position $\pm 5^\circ$

7 0 - 90° Adjusting Screws

- Stainless Steel

8 Piston guides in POM

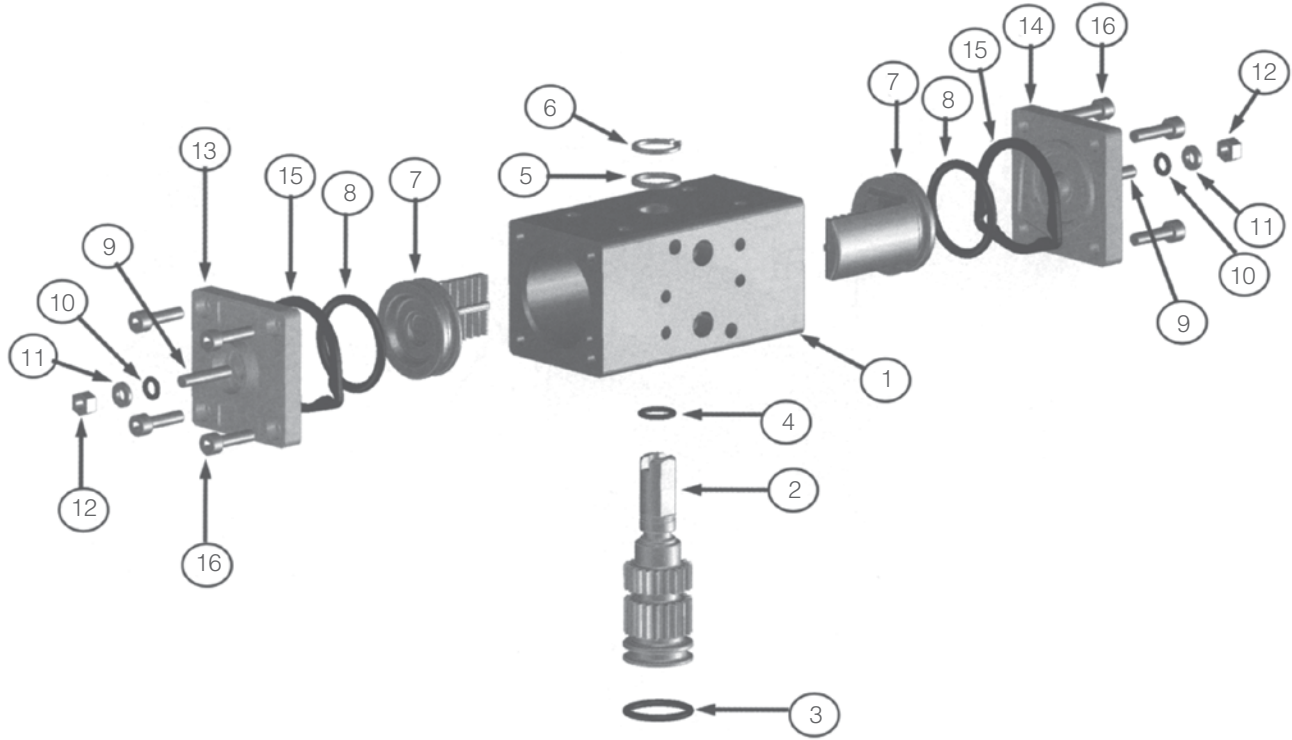
- Large contact area
- Low friction for self-lubricating material
- Long life

9 Pistons made from die cast aluminum

- Chemical nickel plating - optional

10 Seals

- NBR standard version -4°F to +185°F (-20°C to +85°C)
- Viton high temperature version - optional -4°F to +302°F (-20°C to +150°C)
- Silicon low temperature version - optional -40°F to +185°F (-40°C to +85°C)

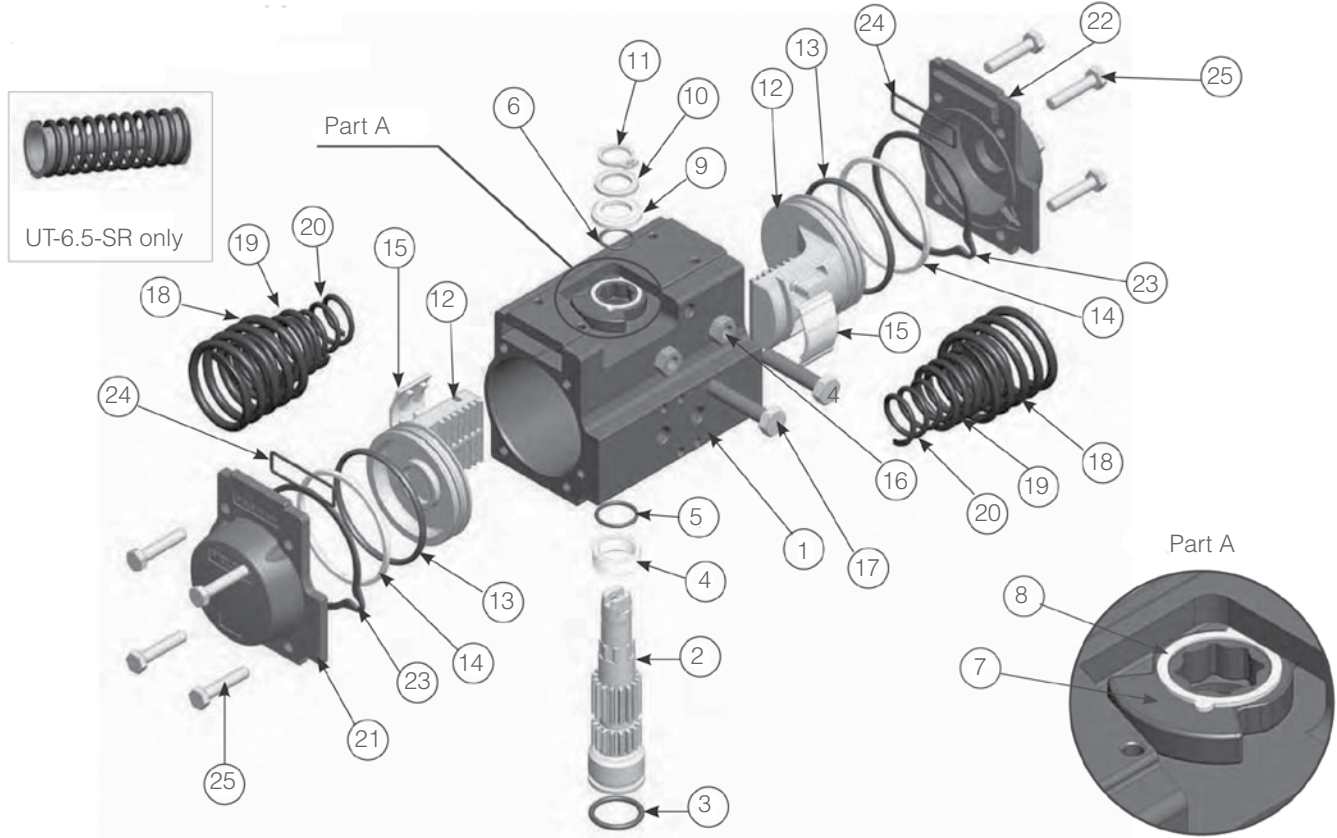
Model: UT-0A-DA


Actuator Parts — UT0A					
Item	Repair Kit	Description	Material	Treatment	Quantity DA
1		Body	Extruded Aluminum	Hard Anodized	1
2		Anti-blowout Pinion	Steel	Nickel Plated	1
*3	R	Lower Pinion O-Ring	NBR		1
*4	R	Top Pinion O-Ring	NBR		1
*5	R	Spacer Ring	(POM) PolyOxyMethylene		1
6	R	Pinion Snap Ring	Steel	Nickel Plated	1
7		Piston	Die Cast Aluminum		2
*8	R	Piston O-Ring	NBR		2
9		Stop Bolt	Stainless Steel		2
*10	R	Stop Bolt O-Ring	NBR		2
11		Washer	Stainless Steel		2
12		Stop Bolt Retaining Nut	Stainless Steel		2
13		Left End Cap	Die Cast Aluminium	Painted	1
14		Right End Cap	Die Cast Aluminum	Painted	1
15	R	End Cap Gaskets	NBR		2
16		End Cap Fixing Screw	Stainless Steel		8

* Parts subject to wear

Note: For high temperature option, Viton replaces NBR, and high temperature grease is used.

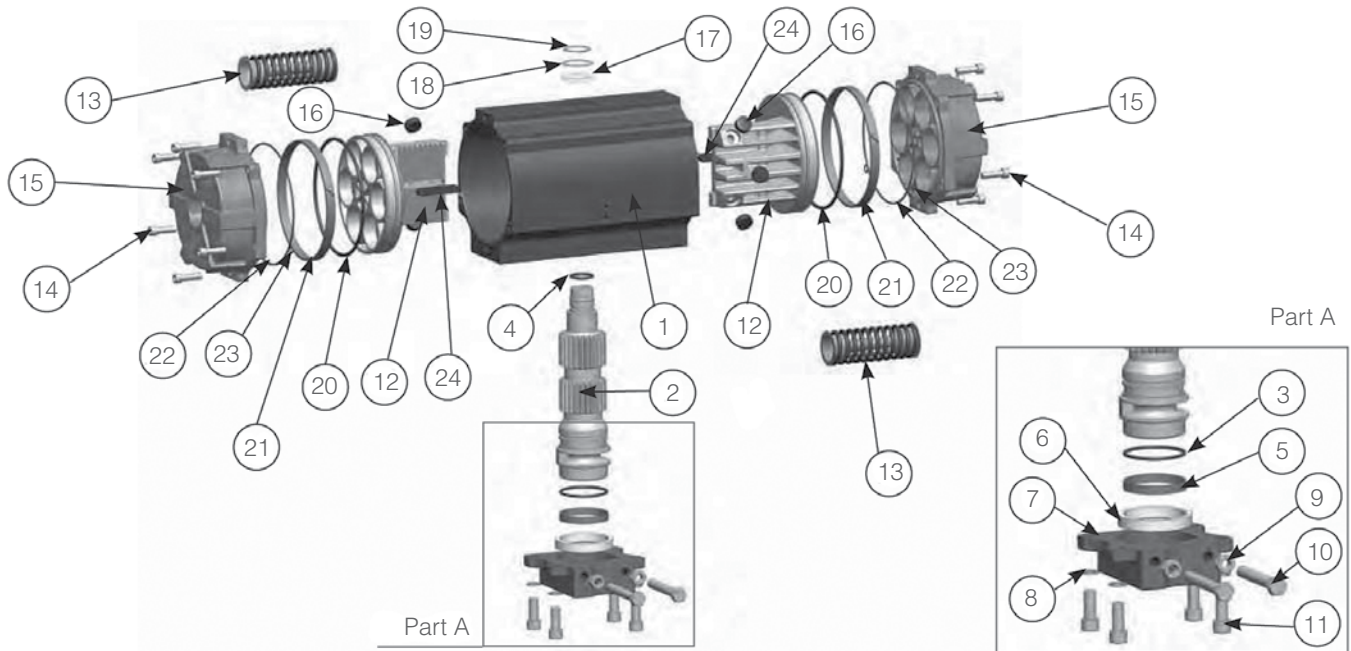
Models: UT-0 to UT-6.5



Actuator Parts — UTOA					
Item	Description	Material	Treatment	Quantity DA	Quantity SR
1	Body	Extruded Aluminum	Hard Anodized	1	1
2	Anti-blowout Pinion	Steel	Nickel Plated	1	1
*3	O-Ring	NBR		1	1
*4	Spacer Ring	POM		1	1
*5	O-Ring	NBR		1	1
*6	O-Ring	NBR		1	1
7	Cam	Stainless Steel		1	1
8	Spacer	POM		1	1
*9	Spacer	POM		1	1
10	Washer	Stainless Steel		1	1
**11	Snap Ring	Steel	Nickel Plated	1	1
12	Piston	Die Cast Aluminum		2	2
*13	O-Ring	NBR		2	2
*14	Anti-friction Ring	POM		2	2
*15	Thrust block	POM		2 [4]	2 [4]
16	Stop Bolt Retaining Nut	Stainless Steel		2	2
17	Stop Bolt	Stainless Steel		2	2
18	External Spring	Steel	Painted	0	See Spring Setting Chart
***19	Central Spring	Steel	Painted	0	
20	Internal Spring	Steel	Painted	0	
21	Left End Cap	Die Cast Aluminum	Painted	1	1
22	Right End Cap	Die Cast Aluminium	Painted	1	1
23	End Cap Seals	NBR		2	2
24	O-Ring	NBR		2	2
25	End Cap Fixing Screw	Stainless Steel		8	8

* Parts subject to wear
 ** Reinforced series DIN 471 - UNI 7436
 [4] Valid for models UT-4.5, 5, 5.5, 6, 6.5
 *** Valid for models UT-5, 5.5, 6 only

Models: UT-6.5 to UT-7.5



Actuator Parts — UT5, UT6, UT7, UT0A					
Item	Description	Material	Treatment	Quantity DA	Quantity SR
1	Body	Extruded Aluminum	Hard Anodized	1	1
2	Anti-blowout Pinion	Steel	Nickel Plated	1	1
*3	O-Ring	NBR		1	1
*4	O-Ring	NBR		1	1
*5	Anti-friction Ring	PTFE 15% Graphite		1	1
*6	Anti-friction Ring	PTFE		1	1
7	Plate	Ductile Iron GGG40	Painted	1	1
8	Washer	Stainless Steel		4	8
9	Stop Bolt Retaining Nut	Stainless Steel		2	2
10	Stop Screw	Steel	Zinc Plated	2	2
11	Fixing Screws	Stainless Steel		UT-7: 4 UT-7.5: 8	UT-7: 4 UT-7.5: 8
12	Piston	Die Cast Aluminum		2	2
13	Precompressed Spring	Steel	Painted	0	See Spring Setting Chart
14	End Cap Fixing Screw	Stainless Steel		UT-7: 12 UT-7.5: 16	UT-7: 12 UT-7.5: 16
15	End Cap	Die Cast Aluminum	Painted	2	2
*16	Thrust block	POM		UT-7: 6 UT-7.5: 8	UT-7: 6 UT-7.5: 8
*17	Spacer Ring	POM		1	1
18	Pinion Washer	Stainless Steel		1	1
	Snap Ring	Steel	Nickel Plated	1	1
*20	O-Ring	NBR		2	2
*21	Anti-friction Ring	PTFE 15% Graphite		2	2
22	O-Ring	NBR		2	2
23	O-Ring	NBR		UT-7: 4 UT-7.5: 2	UT-7: 4 UT-7.5: 2
24	Anti-blowout Key	POM		2	2

* Parts subject to wear

Set No.	Norm Air Supply	External Spring	Internal Spring
1	40	1	1
2	50	2	--
3	60	1	2
4	80	2	1
5	90	2	2

Set No.	Norm Air Supply	External Spring	Center Spring	Internal Spring
1	40	--	2	--
2	50	2	--	--
3	60	1	2	--
4	70	2	--	2
5	80	2	2	--
6	90	2	2	2

Set No.	Norm Air Supply	Quantity of Springs for Each Side
1	30	2/3
2	40	3/3
3	50	3/4
4	60	4/4
5	70	4/5
6	75	5/5
7	80	5/6
8	90	6/6

Type	0A	0	1	2	2.5	3	3.5	4	4.5	5	5.5*	6	6.5*	7	7.5*
Double Act. CCW	0.03	0.07	0.11	0.18	0.36	0.38	0.60	0.80	1.13	1.43	1.99	3.08	4.2	6.2	7.3
Double Act. CW	0.03	0.05	0.10	0.15	0.25	0.34	0.54	0.70	0.94	1.25	1.80	2.41	3.8	5.5	8.2
Spr. Return, CCW	—	0.07	0.13	0.32	0.32	0.54	0.92	1.20	1.64	2.27	3.08	3.58	6.2	9.0	8.7
Spr. Return, CW	—	0.07	0.13	0.30	0.30	0.48	0.75	0.94	1.25	1.60	2.38	2.80	5.4	6.6	9.7

* New Size

Rotation Direction (DA or SR)	0A	0	1	2	2.5	3	3.5	4	4.5	5	5.5*	6	6.5*	7	7.5*
CCW (DA & SR)	2.32	6.10	11.6	22.0	31.1	48.2	78.7	99.5	138	220	283	348	652	915	1556
CW (DA)	1.71	7.93	14.0	26.9	39.1	61.0	104	135	193	306	403	644	918	1086	2697

* New Size

$$\text{Air Consumption, SCFH} = \frac{(\text{Supply Pressure, psig} + \text{Atmosphere Pressure, psig}) \times \text{Volume, in}^3 \times \text{Cycles}}{\text{Atmosphere Pressure, psig} \times \text{Cycle} \times \text{hr.}} \times \frac{1 \text{ ft}^3}{1728 \text{ in.}^3}$$

Note:
Volume = Volume CCW (DA & SR actuators) + Volume CW (DA actuators), and one cycle means one open-close cycle, consisting of one CCW stroke and one CW stroke.

Type	0A	0	1	2	2.5	3	3.5	4	4.5	5	5.5*	6	6.5*	7	7.5*
Double Acting	1.1	2.5	3.7	6.1	8.6	12.1	19.5	24	36	48	64	82	129	182	381
Spring Return	—	2.9	4.3	7.5	10.6	15.4	25.2	31.0	47.4	65	88	121	157	221	443

* New Size

Air Supply Pressure

Maximum Pressure: 116 psi (8 bar)
Maximum Shell Pressure: 150 psi (10,3 bar)

- **Temperature Range:**
 - NBR: -4°F to +185°F (-20°C to +85°C) standard version
 - Viton: -4°F to +302°F (-20°C to +150°C) high temperature version - optional
 - Silicon: -40°F to +185°F (-40°C to +85°C) low temperature version - optional

Position Adjustment: +/- 5° in CCW and CW direction (double adjustment)

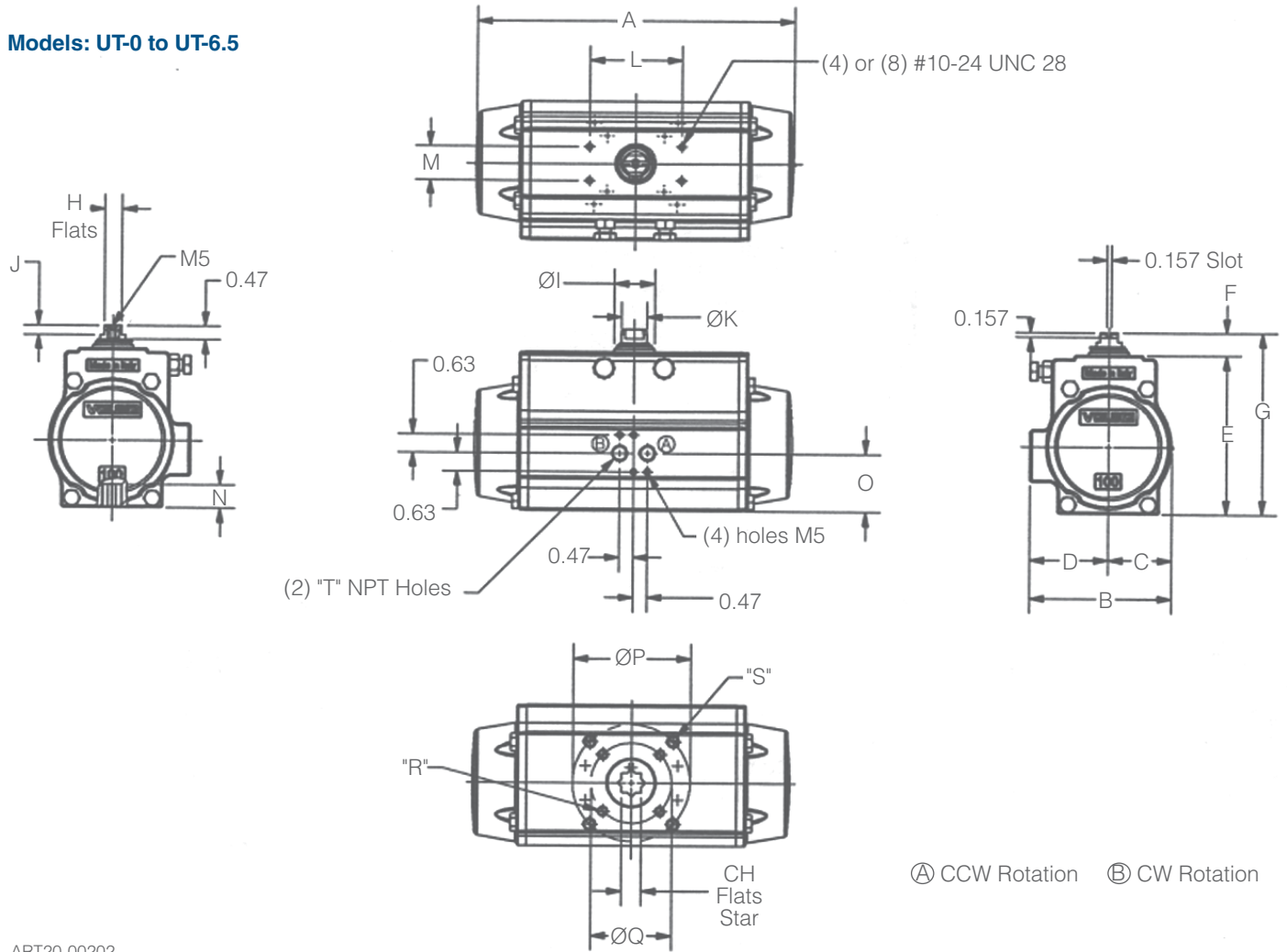
External Connections: See Pages 7-9

Rotation: See Pages 7-9. CCW Port (A), CW Port (B). For spring return, CCW when energized is standard.

Lubrication:

Lubricated: for actuator life (1,000,000 cycles under normal working conditions)

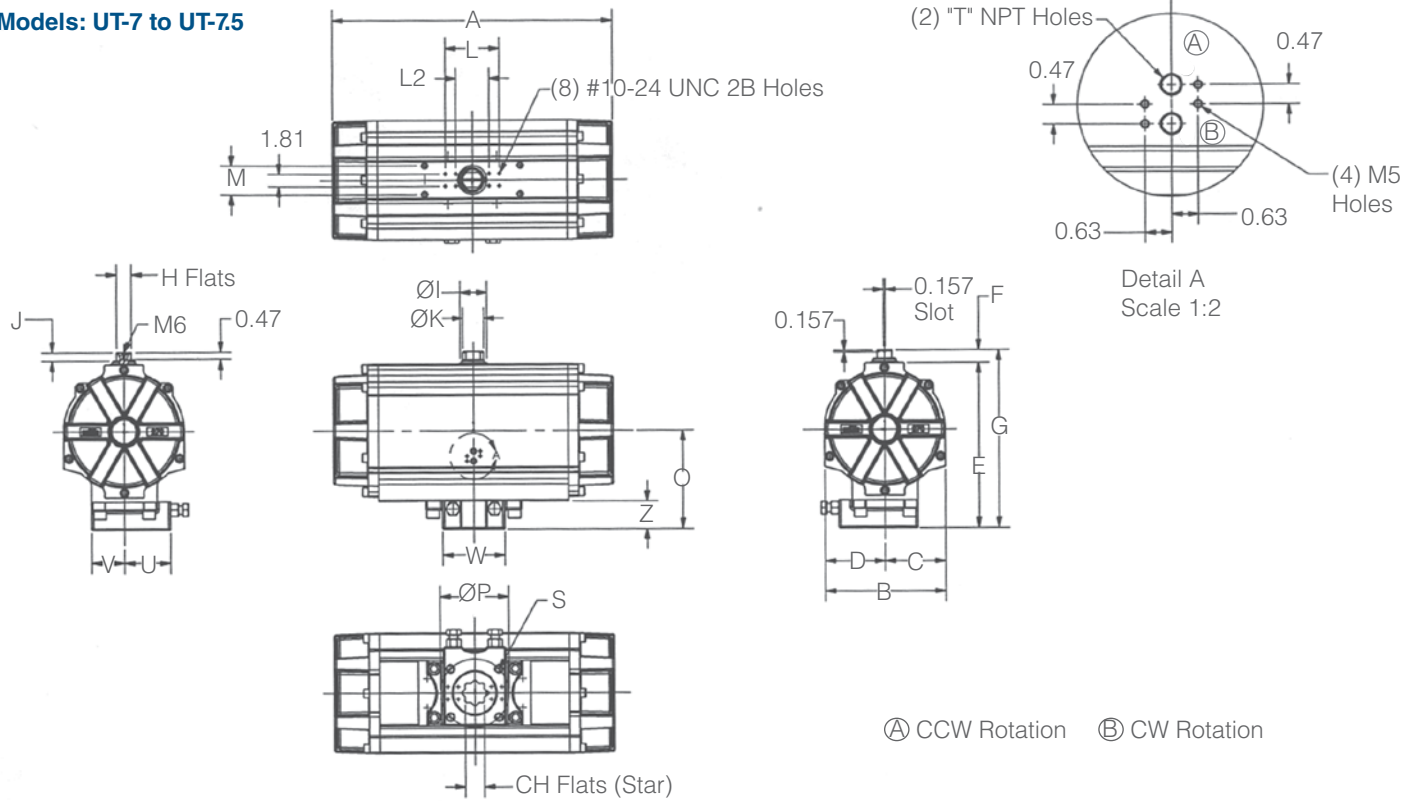
Models: UT-0 to UT-6.5



ART20-00202

Dimensions, Inches																							
UT	Piston Bore (mm)	Drilling ISO 5211	CH	A	B	C	D	E	F	G	H	ØI	J	ØK	L	M	N	O	P	Q	R	S	T NPT
0	52	F03-F05	0.433	5.55	2.80	1.18	1.61	3.21	0.79	4.0	0.35	0.83	0.31	0.47	3.15	1.18	0.47	1.04	1.97	1.42	10-24UNC x 0.29 DP	0.25-20UNC x 0.35 DP	1/8"
1	63	F05-F07	0.551	6.46	3.17	1.40	1.77	3.66	0.79	4.45	0.43	0.98	0.31	0.59	3.15	1.18	0.63	1.08	2.76	1.97	0.25-20UNC x 0.31 DP	0.31-18UNC x 0.47 DP	1/8"
2	75	F05-F07	0.669	8.27	3.72	1.65	2.07	4.37	0.79	5.16	0.51	1.14	0.31	0.75	3.15	1.18	0.75	1.38	2.76	1.97	0.25-20UNC x 0.31 DP	0.31-18UNC x 0.47 DP	1/8"
2.5	85	F05-F07	0.669	9.47	4.17	1.87	2.30	4.92	0.79	5.71	0.59	1.38	0.31	0.87	3.15	1.18	0.75	1.65	2.76	1.97	0.25-20UNC x 0.31 DP	0.31-18UNC x 0.47 DP	1/8"
3	100	F07-F10	0.669	10.83	4.84	2.17	2.68	5.43	0.79	6.21	0.59	1.38	0.31	0.87	3.15	1.18	0.81	1.97	4.02	2.76	0.31-18UNC x 0.31 DP	0.38-16UNC x 0.55 DP	1/4"
3.5	115	F07-F10	0.866	13.11	5.39	2.52	2.87	6.39	1.18	7.57	0.87	1.93	0.55	1.26	5.12	1.18	0.95	1.97	4.02	2.76	0.31-18UNC x 0.47 DP	0.38-16UNC x 0.59 DP	1/4"
4	125	F07-F10	0.866	14.65	5.83	2.68	3.15	6.87	1.18	8.05	0.87	1.93	0.55	1.26	5.12	1.18	0.95	2.40	4.02	2.76	0.31-18UNC x 0.47 DP	0.38-16UNC x 0.59 DP	1/4"
4.5	140	F10-F12	1.063	17.13	6.46	3.01	3.44	7.76	1.18	8.94	0.94	1.93	0.63	1.38	3.15/5.12	1.18	1.14	2.80	4.92	4.02	0.38-16UNC x 0.59 DP	0.5-13UNC x 0.71 DP	1/4"
5	160	F10-F12	1.063	19.69	7.32	3.43	3.90	8.70	1.18	9.88	1.18	2.24	0.63	1.57	3.15/5.12	1.18	1.26	3.15	4.92	4.02	0.38-16UNC x 0.55 DP	0.5-13UNC x 0.71 DP	1/4"
5.5	180	F14	1.417	19.41	8.39	3.86	4.53	9.96	1.18	11.14	1.42	2.24	0.63	1.77	3.15/5.12	1.18	1.69	3.90	5.51	-	-	0.62-11UNC x 0.98 DP	1/4"
6	200	F14	1.417	22.78	8.54	4.25	4.29	10.94	1.18	12.13	1.42	2.24	0.63	1.97	3.15/5.12	1.18	1.46	3.07	5.51	-	-	0.62-11UNC x 0.94 DP	1/4"
6.5	230	F16	1.811	27.17	9.78	4.88	4.90	12.80	1.18	13.97	1.42	2.64	0.63	1.97	3.15/5.12	1.18	1.97	3.62	6.50	-	-	0.75-10UNC x 1.14 DP	1/4"

Models: UT-7 to UT-75

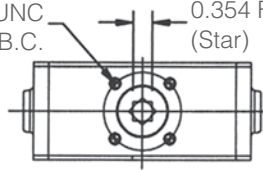
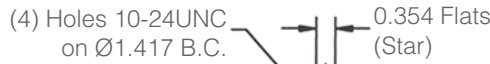
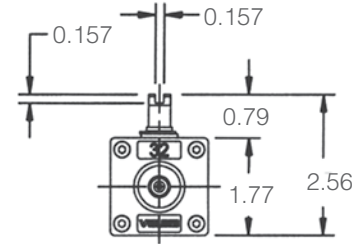
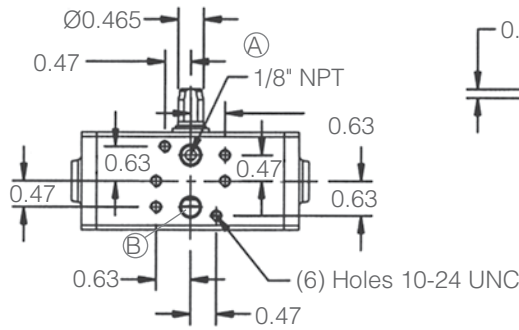
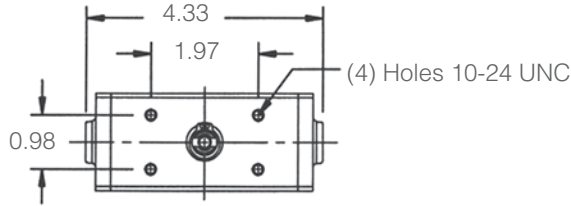
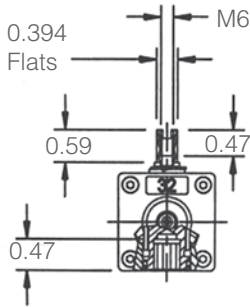


ART20-00203

Dimensions, Inches																						
UT	Piston Bore (mm)	Drilling ISO 5211	CH	A	B	C	D	E	F	G	H	ØI	J	ØK	L	L2	M	N	O	P	R	S
7	270	F16	1.811	26.46	11.42	5.71	5.71	15.71	1.18	16.89	1.42	2.76	0.79	1.97	5.12	3.15	1.18	1.97	7.40	6.50	0.75-10UNC x 1.18 DP	—
7.5	330	F16-F25	1.970	35.46	15.82	7.91	7.91	19.88	1.97	21.85	1.42	4.29	0.79	1.81	5.12	-	1.18	2.44	11.14	10.0	0.75-10UNC x 1.18 DP	(8) 0.62 UNC x 0.91 DP

Dimensions, Inches (Con't)					
UT	T NPT	U	V	W	Z
7	1/4"	4.37	3.11	9.06	2.68
7.5	1/2"	5.31	5.31	14.0	3.74

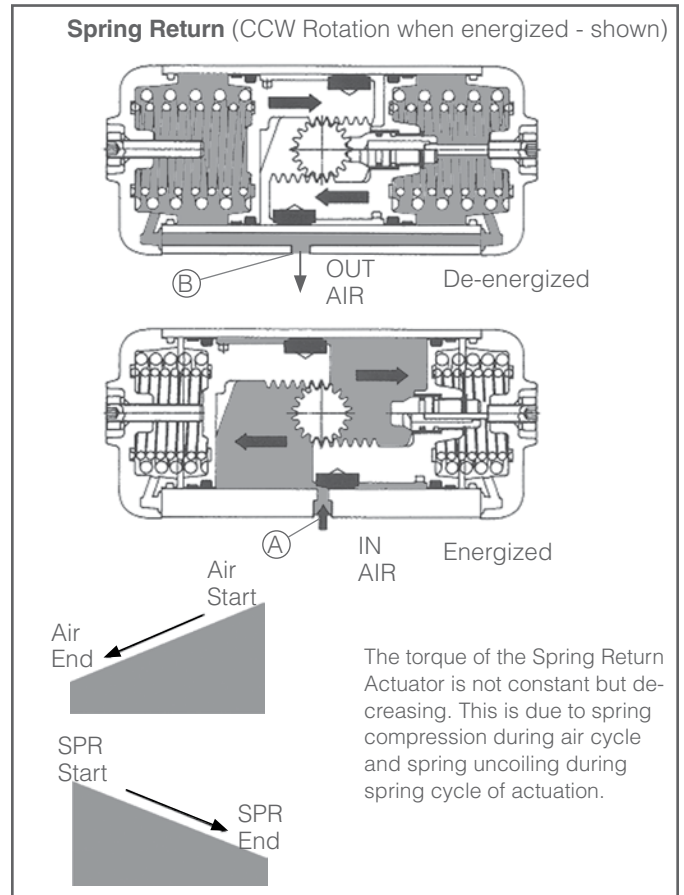
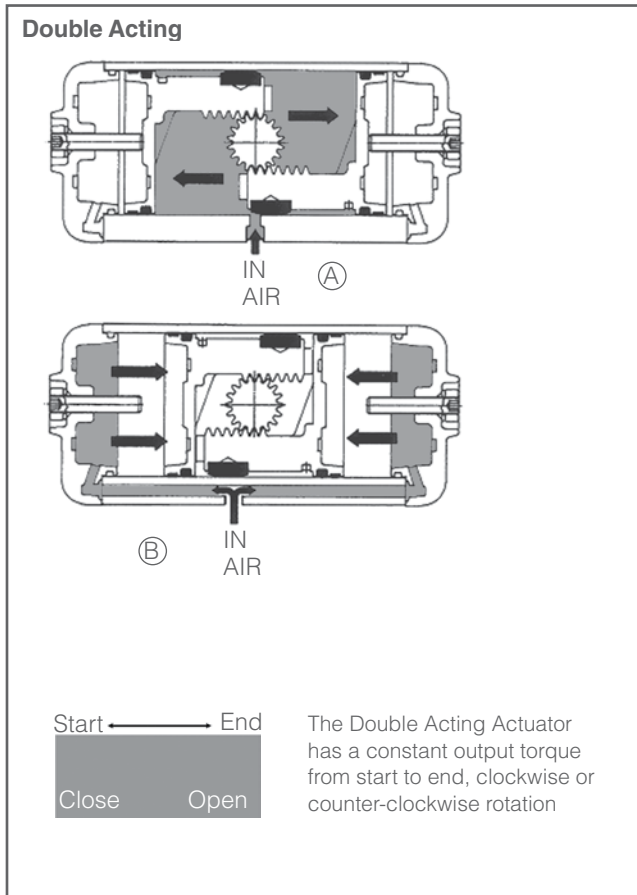
Models: UT-0-DA



Ⓐ CCW Rotation Ⓑ CW Rotation

ART1108L

Torque Characteristics



735 Torque Outputs																			
Model		Spring		Air Pressure (psig)															
Size	Spring Set			40		50		60		70		80		90		100		115	
		Open, Deg		Open, Deg															
		0	90	0	90	0	90	0	90	0	90	0	90	0	90	0	90	0	90
Torque, in-lbs		Torque, in-lbs																	
UT-0	1	32	43	49	23	72	46	95	70										
	2	42	59			61	31	84	54	107	77								
	3	46	66					81	47	104	70	127	94	150	117				
	4	58	82					69	31	93	54	117	78	140	101	163	125		
	5	72	105							78	32	101	55	125	79	148	102	183	137
UT-1	1	44	85	92	39	134	80	176	122										
	2	58	109			120	56	162	98	204	140								
	3	71	137					149	78	191	120	233	162	275	205				
	4	85	152					136	54	177	96	219	138	261	180	303	222		
	5	111	196							151	52	193	95	235	137	276	179	339	241
UT-2	1	89	173	168	63	244	139	320	214										
	2	118	227			216	85	291	160	366	235								
	3	134	250					275	137	351	212	427	288	502	363				
	4	162	304					247	83	323	158	398	234	473	309	549	385		
	5	205	381							279	81	354	157	430	232	505	308	618	421
UT-2.5	1	142	242	238	108	349	219	460	330										
	2	176	298			316	163	427	274	538	385								
	3	215	361					388	211	498	322	609	433	720	543				
	4	249	417					354	155	465	265	576	376	687	487	798	598		
	5	321	536							393	146	504	257	614	368	725	478	891	645
UT-3	1	218	395	384	154	556	326	728	499										
	2	289	521			486	200	658	372	831	545								
	3	318	564					628	329	801	502	973	674	1146	847				
	4	389	690					558	203	730	375	903	548	1076	720	1248	893		
	5	497	860							630	206	803	379	975	551	1148	724	1406	982
UT-3.5	1	363	658	650	270	935	555	1220	840										
	2	449	836			848	378	1133	663	1418	948								
	3	538	957					1045	541	1330	827	1614	1112	1900	1397				
	4	625	1134					958	365	1243	650	1529	936	1813	1220	2098	1505		
	5	800	1430							1068	352	1352	636	1638	922	1923	1207	2351	1635
UT-4	1	470	877	850	328	1225	703	1599	1077										
	2	560	1040			1135	540	1510	914	1884	1288								
	3	718	1313					1351	640	1725	1015	2100	1389	2474	1763				
	4	808	1477					1262	478	1636	852	2010	1226	2384	1600	2758	1974		
	5	1055	1914							1388	415	1763	789	2137	1164	2511	1538	3073	2099
UT-4.5	1	726	1345	1241	506	1741	1007	2242	1507										
	2	814	1522			1644	821	2145	1322	2645	1822								
	3	1036	1956					1915	861	2415	1362	2916	1862	3416	1755				
	4	1133	2124					1808	667	2309	1167	2810	1668	3319	2177	3819	2678		
	5	1452	2726							1981	513	2482	1021	2982	1522	3483	2023	4234	2773
UT-5	1	735	1159	2022	1571	2718	2267												
	2	1053	1664			2382	1736	3078	2432										
	3	1266	1991			2160	1382	2858	2079	3560	2781								
	4	1637	2584					2459	1450	3161	2152	3859	2850						
	5	1788	2823							2993	1904	3691	2602	4397	3308				
	6	2372	3744									3080	1620	3784	2324	4480	3020	5532	4072
UT-5.5	1	903	1487	2902	2282	3866	3247												
	2	1416	2230			3318	2450	4282	3415										
	3	1611	2602			3114	2061	4077	3024	5035	3982								
	4	2319	3664					3325	1926	4283	2885	5246	3847						
	5	2319	3717							4282	2795	5246	3759	6210	4724				
	6	3222	5151									4290	2272	5255	3237	6219	4201	7666	5648

Torque Outputs																			
Model		Spring		Air Pressure (psig)															
Size	Spring Set			40		50		60		70		80		90		100		115	
		Open, Deg		Open, Deg															
		0	90	0	90	0	90	0	90	0	90	0	90	0	90	0	90	0	90
		Torque, in-lbs		Torque, in-lbs															
UT-6	1	1496	2222	3610	2866	4904	4160												
	2	2098	3124			4217	3164	5517	4464										
	3	2549	3788			3766	2509	5065	3808	6359	5102								
	4	2992	4620					4534	2870	5828	4164	6854	5247						
	5	3593	5346							5216	3437	6520	4741	7816	6037				
	6	4487	6842									5538	3148	6833	4444	8134	5744	10076	7686
UT-6.5	1	3443	5895	4930	2328	7075	4473	9217	6615										
	2	4124	7072	4207	1073	6349	3216	8492	5358										
	3	4815	8258					7758	4112	9907	6260								
	4	5505	9435					7032	2855	9181	5003	11330	7152						
	5	6196	10612					6069	1607	8401	3755	10595	5904	12733	8042				
	6	6877	11789							7722	2500	9869	4647	12009	6787	14158	8936	17372	12150
UT-7	1	4478	7001	8112	5545	11335	8768	14558	11991										
	2	5372	8399	7156	4076	10379	7299	13602	10522										
	3	6266	9798	6200	2607	9423	5830	12646	9053	15869	12276								
	4	7169	11196			8476	4370	11699	7592	14922	10815	18145	14038						
	5	8063	12595					10743	6123	13966	9346	17189	12569	20412	15792				
	6	8957	13993					9787	4654	13010	7877	16233	11100	19456	14323				
	7	9851	15400					8832	3185	12054	6408	15277	9631	18498	12852	21715	16068		
	8	10745	16799					7876	1716	11099	4938	14321	8161	17542	11382	20759	25593	19433	
UT-7.5	1	7824	12143	14152	9558	19767	15174	25383	20789										
	2	9382	14577	12488	6974	18103	12589	23719	18205										
	3	10948	17002	10824	4398	16440	10014	22055	15630	27671	21245								
	4	12515	19436			14784	7429	20400	13045	26016	18661	31631	24276						
	5	14082	21861					18736	10470	24352	16085	29967	21701	35583	27316				
	6	15639	24295					17072	7885	22688	13501	28303	19116	33919	24732				
	7	17206	26720					15417	5310	21033	10925	26648	16541	32262	22155	37872	27764		
	8	18772	29154							19370	8342	24984	13956	30598	19570	36208	25180	44630	33602

Torque Outputs – Double Acting Actuators (in-lbs) Air Supply Pressure (psig)									
Actuator Size		40	50	60	70	80	90	100	115
UT-0A	DA32	36	44	53	62	71	80	89	102
UT-0	DA52	88	111	134	157	180	203	226	261
UT-1	DA63	153	195	237	279	321	364	406	469
UT-2	DA75	287	363	438	514	589	665	740	853
UT-2.5	DA85	409	519	630	741	851	962	1072	1238
UT-3	DA100	647	819	991	1163	1335	1508	1680	1938
UT-3.5	DA115	1070	1356	1641	1926	2211	2496	2781	3209
UT-4	DA125	1409	1783	2158	2532	2906	3281	3655	4217
UT-4.5	DA140	2001	2503	3005	3506	4008	4510	5012	5765
UT-5	DA160	2799	3499	4198	4897	5596	6296	6995	8044
UT-5.5	DA180	3857	4820	5783	6746	7709	8672	9635	11080
UT-6	DA200	5194	6492	7790	9088	10386	11683	12981	14928
UT-6.5	DA230	8585	10731	12876	15022	17167	19312	21458	24676
UT-7	DA270	12617	15771	18925	22080	25234	28388	31542	36273
UT-7.5	DA330	22461	28075	33690	39304	44919	50533	56148	64569

How to Order					
Actuator Series	Size	Type	Rotation	Air Supply to Actuator	Options
UT	0A	SR = Spring Return (Range: UT-0 - UT-7.5)	*CCW = Counter-clockwise Rotation (Standard)	40 = 40 psi	B = Standard
	0	DA = Double Acting (Range: UT-0A- UT7.5)	CW = Clockwise Rotation	50 = 50 psi	H = High Temperature
	1			60 = 60 psi	L = Low Temperature
	2			70 = 70 psi	E3 = Std Temp, Nickel plated
	2.5			80 = 80 psi	E6 = Std. Temp, Polyester Coated
	3			90 = 90 psi	
	3.5			100 = 100 psi	
	4			115 = 115 psi	
	4.5				
	5				
	5.5				
	6.0				
	6.5				
	7				
	7.5				

Sample Ordering Schematic

UT	1	SR	CCW	80	B
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*Counter-clockwise (CCW) rotation when energized is standard