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APOLLO[®]

valve automation products

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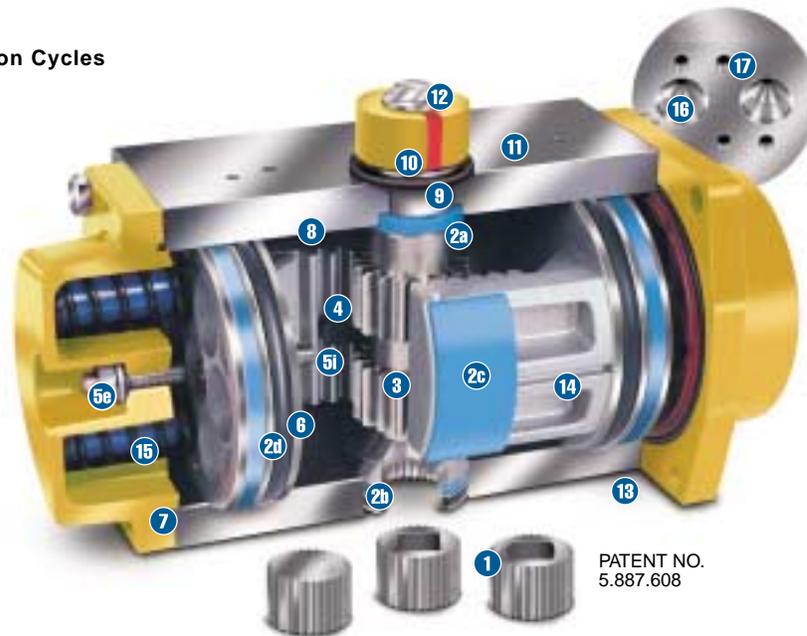
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Pneumatic Actuators

Apollo® CompacTorque™ Rack & Pinion Actuator

2 Year Warranty
Tested to 2 Million Cycles



1. Unique Universal Shaft Adapter

Precision replaceable insert including variable internal geometry configuration meets any custom requirement. Standard insert is high strength FLN-4205. Optional stainless steel insert available. *Size 030 thru 080 only.

2. Bearings

Replaceable top (2a), bottom (2b), body (2c), and piston (2d) are manufactured of nylon 4-6. Benefits include low coefficient of friction, minimal moisture absorption, stability above 400°F, and excellent chemical resistance.

3. Output Shaft and Pinion Gear

One piece high strength alloy steel pinion shaft, precision machined gear teeth for precise fit, efficiency and long life. Standard pinion is electroless nickel coated for corrosion protection and is blowout proof. Optional stainless steel pinion shaft available.

4. Piston Guides

Piston guides maintain optimum piston position and prevent pinion shaft blowout.

5. Travel Stops

Provides for + or - 4 degrees travel adjustment in both directions, internal (5i) and external (5e).

6. Piston Seals

Replaceable pressure containment seals of permanently lubricated nitrile. Also available in fluorocarbon or other compounds for extreme temperature operation.

7. Die Cast Aluminum End Caps

Same end cap serves double acting and spring return models. Cast in spring pockets allow standard double acting actuator conversion to spring return by simply adding unique preloaded spring cartridges. Polyester powder coat is standard with additional protections available.

8. Extruded Aluminum Body

Precision extruded aluminum alloy with hard anodizing inside and out after finish machining. Additional protection coatings are available.

9. Thrust Washers

Double thrust washers of 45% glass reinforced, heat stabilized PPA backed by stainless steel provides extra protection against vertical thrust.

10. Position Indicator

Unique position indicator can be indexed to show alternate position. Plastic indicator inserts can be replaced with metal or magnetic targets for use with various proximity sensors.

11. Accessory Mounting

Manufactured in accordance with international specification VDI/VDE 3845 NAMUR to provide standardized drilled and tapped standard mounting for accessories such as positioners and limit switches.

12. Namur Slotted Shaft

In accordance with the international standard to provide a self-centering positive drive for positioners and switches.

13. Actuator Mounting

Manufactured in accordance with ISO 5211 promoting easy installation of the actuator directly on valves, gearboxes, or with ISO brackets. Conformance with DIN3337 is easily accomplished by rotating the Universal Shaft Adapter 45 degrees.

14. Die Cast Pistons

Precision die cast pistons are multiguided through full face engagement with the pinion and piston guide. Full depth machined piston teeth provide engagement with minimum backlash.

15. Pre-Loaded Spring Cartridges

Converts a standard double acting actuator to a spring return actuator by simply removing end caps and adding the unique spring cartridges.

16. Internal Porting

Large internal ports enhance quick operation and eliminates the cost of external tubing.

17. Namur Solenoid Mounting

Manufactured in accordance with this international standard permitting direct mounting of a wide variety of solenoid valves.

Compactorque Pneumatic Actuators (Corrosion Protection)

Specification

The Apollo® CompacTorque™ actuator is pneumatically operated and travels a minimum of 90 degrees in each direction and has internal and external travel stops to provide for + or - 4 degrees adjustment on a 90 degree stroke. The actuator is totally enclosed with no external moving parts. All pneumatic passageways are integral to the actuator housing so as to eliminate the need for external tubing. All solenoid mounting conforms to NAMUR specifications to permit direct mounting of a wide variety of solenoid valves. CompacTorque™ actuators are rack and pinion design; the output torque is linear throughout the travel and designed for pneumatic operation up to a maximum pressure of 142 psig (10 bar).

CompacTorque™ actuators are able to operate with other media such as hydraulic oil or water. All double acting and spring return units are suitable for both on/off and throttling applications.

Spring return units are dimensionally the same as double acting units, which saves space and weight.

The actuator is supplied with the following as standard:

- External end of travel adjustments integral with the end caps.
- Mechanical visual position indicator and the pinion is designed to allow manual override by simply removing the position indicator.
- One piece output pinion manufactured of high strength steel and electroless nickel coated for corrosion protection.
- NAMUR slotted connection
- Replaceable splined adapter to accommodate custom shaft connections
- Pistons and pinion that have a Nylon 4-6 bearing pad and rings, which extends the life of the actuator and reduces friction
- Corrosion resistant polyester powder coated end caps
- Hard anodized aluminum housing
- All fasteners are high strength stainless steel
- Permanently lubricated nitrile seals
- Self contained spring cartridges, heat treated and polyester powder coated for corrosion protection, that ensure safe disassembly

The Apollo® CompacTorque™ Universal Shaft Adapter (U.S.A.)

Apollo® CompacTorque™ introduces the newest design concept in actuators, the Universal Shaft Adapter (U.S.A.). The universal shaft adapter concept, was designed and manufactured with ease of actuator mounting in mind. The actuator incorporates the use of a replaceable splined adapter instead of a drive shaft connection with a fixed machined dimension and configuration. ISO 5211 - DIN 3337 configuration can be obtained by indexing insert 45 degrees from parallel. Inserts with other shaft connections and configurations are available. Optional stainless steel inserts are available.

Hard Anodized Protection

Hard Anodic oxidation is an electrolytic conversion process which forms an oxide film approximately one half of the total depth of the entire hard anodizing process. Continuation of this process produces the “hard” anodic coating to approximately 2 mils (50 microns). The oxide coating is integral with the base substrate and is one of the hardest materials known with a hardness of corundum (45 to 65 Rockwell C).

EPC 316

EPC 316 is a FDA Epoxy Powder pigmented with 316L stainless steel flakes applied by an electrostatic spray finishing

Apollo® CompacTorque Numbering System						
	0- Std. (Protection A)	Size	Option	Spring Set	Less One Spring Imbalance	Rev. Level
D - Double Acting	1- ENC(Protection C) 2- Seal Kit	1	0-Nitrile (Std.) 0°F to +250°F	0	0	A-Standard B-Without Universal Shaft Adapter*
S - Spring Return	3- Spring Kit 4- Indicator Kit 5- Stop Kit	2 3 4	1-Viton 32°F to +350°F 2-Low Temp. Nitrile -50°F to +250°F	2 3 4	3 4 5	M-Metric* Z-Special**
K - Kit	6- Polyester Powder Coated (Protection B)*** 7- Stainless Steel Epoxy Coated (Protection D) 8- Stainless Steel Epoxy Coated 316 SS Pinion (Protection E) G- Red End Caps (Protection A) H- Blue End Caps (Protection A) J- Black End Caps (Protection A)	5 6 7 8 9 A	3-Neoprene	5 6	6	

* Select one USA (Universal Shaft Adapter) from selection chart
** Select one USA, specify bolt pattern on bottom of Actuator
*** Specify if Polyester Coating is Yellow, Red, Blue or Black

Compactorque Pneumatic Actuators

(Corrosion Protection)

process on a super clean surface. After application the pieces must be cured at 350°F (177°C). With a normal thickness of 3.0 - 4.0 mils (76-102 microns) of EPC 316 coating, resistance to salt spray in accordance with ASTM B-117 exceeds 2000 hours and has a pencil hardness of 2H as per ASTM D-3363.

Electroless Nickel Coating

Nickel deposits are produced by chemical reduction of nickel into catalytic metallic or catalyzed nonmetallic substrates without the use of electricity. Total "as plated" thickness is the same shape of the surface; therefore, close tolerances (within 20 to 30 microns) can be maintained. Normal hardness averages about 49 Rockwell C.

Polyester Powder Coating

Apollo® CompacTorque™ uses only the most modern thermosetting polyester powder coating resin. When subjected to elevated temperatures, these coatings melt, flow, and chemically cross link within themselves or with other reactive components to form a higher molecular weight reaction product. This resin system can produce thin paint like surface coatings in the 1 to 3 mil thickness range (25 to 76 microns) having a 2H pencil hardness as per ASTM D3363 and a salt spray resistance of 1000 hours in accordance with ASTM B117. Unlike epoxy coatings, polyester powder coatings offer excellent resistance to UV rays.

3T Series Valve Mounting Configuration

The 3T series actuator family utilizes an ISO 5211 mounting bolt pattern for the attachment of valve mounting brackets. Conbraco has been utilizing ISO 5211 mounting configurations since 1990. Therefore, there exists an extensive selection of engineered stainless steel brackets for the 3T series. The variety of valve and actuator combinations is so extensive that mounting kit identification is provided in a separate document (Mounting Kit Selection Guide). Many of the 3T series actuators have multiple mounting bolt patterns (see dimensions w-w1-w2 on the 3T series dimensional drawings). These alternate bolt patterns may be used as attachment points to brackets that have not been supplied by Conbraco or the automation of other manufacturer's valves. This flexibility of bracket attachment is provided so that the actuator can be used to automate any device that requires 90 degrees or less rotary motion and fits within the torque profile available from the actuator.

Universal Shaft Adapters			
NUMBER	CONBRACO DESCRIPTION	NUMBER	CONBRACO DESCRIPTION
CX01605	ADAPTER, 11MM SQ, 3T030/STD. REV. A	CX01637	ADAPTER, 19MM SQ, 3T060/STD. REV. A
CX01458	ADAPTER, 11MM SQ, 3T030, SS	CX01638	ADAPTER, 22MM SQ, 3T065/STD. REV. A
CX01606	ADAPTER, 14MM SQ, 3T030	CX01696	ADAPTER, 22MM SQ, 3T070/STD. REV. A
CX01614	ADAPTER, 14MM SQ, 3T040/3T050/STD. REV. A	CX01718	ADAPTER, 27MM SQ, 3T080/STD. REV. A
CX01493	ADAPTER, 14MM SQ, 3T040/3T050, SS	CX01604	ADAPTER, BLANK, 3T030
CX01615	ADAPTER, 17MM SQ, 3T040/3T050	CX01486	ADAPTER, BLANK, 3T040/3T050
CX01494	ADAPTER, 17MM SQ, 3T040/3T050, SS	CX01636	ADAPTER, BLANK, 3T060/3T065
CX01616	ADAPTER, 19MM SQ, 3T040/3T050/STD. REV. A	CX01695	ADAPTER, BLANK, 3T070
CX01495	ADAPTER, 19MM SQ, 3T040/3T050, SS	CX01717	ADAPTER, BLANK, 3T080

Butterfly/Actuator Mounting Kit Chart for ISO Drilling (B) - CarbonSteel/Zinc Plated Hardware										
130/132 Series Adapter Numbers										
Size	3T30	3T40	3T50	3T60	3T65	3T70	3T80	3T90	3TA0	
1.5										
2		CX03430	CX03430	CX03433	CX03433					
2.5		CX03430	CX03430	CX03433	CX03433					
3		CX03430	CX03430	CX03433	CX03433					
4		CX03431	CX03431	CX03434	CX03434	CX03438				
5			CX03432	CX03435	CX03435	CX03439				
6			CX03432	CX03435	CX03435	CX03439				
8				CX03437	CX03437	CX03441	CX03444			
10						CX03442	CX03445			
12							CX03446			
140/142 Series Adapter Numbers										
2		CX03430	CX03430	CX03433	CX03433					
2.5		CX03430	CX03430	CX03433	CX03433					
3		CX03430	CX03430	CX03433	CX03433					
4		CX03431	CX03431	CX03434	CX03434	CX03438				
5		CX03431	CX03431	CX03434	CX03434	CX03438				
6		CX03431	CX03431	CX03434	CX03434	CX03438				
8				CX03436	CX03436	CX03440	CX03443			
10				CX03437	CX03437	CX03441	CX03444			
12							CX03446			
141/143 Series Adapter Numbers [Double "D"]										
2		CX03447	CX03447	CX03450	CX03450	CX03454				
2.5		CX03447	CX03447	CX03450	CX03450	CX03454				
3		CX03447	CX03447	CX03450	CX03450	CX03454				
4		CX03448	CX03448	CX03451	CX03451	CX03455				
5			CX03449	CX03452	CX03452	CX03456				
6			CX03449	CX03452	CX03452	CX03456				
8				CX03453	CX03453	CX03457	CX03459			
10						CX03458	CX03460			
12							CX03461			
14							CX03461			

Apollo® Compactorque Pneumatic Actuators Mounting

Accessory Mounting

The 3T series actuator conforms to NAMUR VDI/VDE 3845 dimensional mounting standards. This insures the greatest compatibility with actuator mounted accessories. Mounting brackets for positioners and limit switches will therefore become standardized. This is a significant advantage to the end user in that it reduces the number of unique parts necessary to support an automation program. Eventually all actuator manufacturers will have to provide their products with NAMUR interface compatibility, the 3T series has it now. Proprietary product uniqueness is sacrificed to provide end users with a recognized international standard mounting arrangement.

Solenoid Mounting

The 3T series actuators also utilize NAMUR standard dimensions for this interface. Like the accessory interface this is an international standard set of dimensions. There are two methods of attaching solenoid control valves to the actuator. The most common is to use a NAMUR style solenoid of the correct designation. This solenoid is attached to the actuator with two 5 mm screws with O-Rings providing the required seals. A single pneumatic supply connection to a NPT threaded port is all that

is required to complete the air line assembly. The less common method is to remote mount the solenoid and connect it to the actuator with tubing and fittings. This configuration is necessary for 3TSOAO & 3TDOAO. The ports in the actuator are tapped with standard NPT pipe threads for this option. Electrical connections to the solenoids can be made in a variety of ways.

The 3TD-010 is so compact that the NAMUR mounting pattern had to be rotated 90°. An adapter has been designed that allows the installation of the Conbraco solenoid in the same orientation as the rest of the product family. To do this the adapter has to perform two tasks. First, it adapts the NAMUR mounting pattern to the Conbraco solenoid. Second, it rotates the solenoid so that the air connections are oriented the same as those on the rest of the product family.

Automated valve cycle time is dependent on many factors associated with each specific installation and is almost impossible to predict accurately. Cycle times of less than one second are generally not recommended. Fast cycle times reduce seal life and expose the valve and actuator to shock loads that can reduce service life.

DOUBLE ACTING CHART																																																																																																																												
AIR SUPPLY IN PSIG	ACTUATOR MODEL																																																																																																																											
	3T-010		3T-020		3T-030		3T-040		3T-050		3T-060		3T-065		3T-070		3T-080		3T-090		3T-0A0																																																																																																							
40	30	72	130	274	416	650	1075	1409	2771	5198	12631	45	108	194	411	623	975	1613	2114	4155	7797	18946	60	144	259	548	831	1300	2151	2819	5548	10396	25261	80	180	324	685	1039	1625	2689	3524	6929	12995	31577	100	216	389	822	1247	1950	3226	4228	8310	15594	37892	120	274	478	922	1396	2151	3524	4526	8810	17188	41577																																																										
UNITS	DA	DA	SR	DA	SR	DA	SR	DA	SR	DA	SR	DA	SR	DA	SR	DA	SR	DA	SR	DA	SR	DA	SR																																																																																																					
VOLUME CU. INCH	3	13.4	7.9	27	10.5	37	14	56	21	98	40	159	61	220	92	483	196	855	366	1343	610	45	134	79	274	105	374	140	566	211	989	404	1599	616	2209	924	4834	1966	8559	3666	13436	6106	60	144	83	294	115	404	140	566	211	989	404	1599	616	2209	924	4834	1966	8559	3666	13436	6106	80	180	108	374	140	566	211	989	404	1599	616	2209	924	4834	1966	8559	3666	13436	6106	100	216	134	478	180	685	269	1075	423	1719	661	2689	1039	4155	1613	6239	2411	9797	3797	14946	5746	120	274	169	578	211	831	300	1300	501	1951	726	2819	1039	4155	1613	6239	2411	9797	3797	14946	5746
WEIGHT LB.	1	2.3	2.8	3.4	3.9	6.3	6.9	9.1	10.1	13.4	15.2	19.3	22.4	26.9	30.4	50.4	56.5	97	115	198.5	247	1	2.3	2.8	3.4	3.9	6.3	6.9	9.1	10.1	13.4	15.2	19.3	22.4	26.9	30.4	50.4	56.5	97	115	198.5	247	1	2.3	2.8	3.4	3.9	6.3	6.9	9.1	10.1	13.4	15.2	19.3	22.4	26.9	30.4	50.4	56.5	97	115	198.5	247	1	2.3	2.8	3.4	3.9	6.3	6.9	9.1	10.1	13.4	15.2	19.3	22.4	26.9	30.4	50.4	56.5	97	115	198.5	247	1	2.3	2.8	3.4	3.9	6.3	6.9	9.1	10.1	13.4	15.2	19.3	22.4	26.9	30.4	50.4	56.5	97	115	198.5	247																			
ACTUATOR SPEED* OPEN/CLOSE SECONDS		.5/5	.5/5	.5/6	.6/8	.5/6	.6/1	.5/8	.6/1.2	.7/1.8	1/1.2	.8/1	1.1/1.5	1/1	1.2/2	1.2/1.5	2/2.5	3.5/4.5	4.5/6	5/5.5	6/7		.5/5	.5/5	.5/6	.6/8	.5/6	.6/1	.5/8	.6/1.2	.7/1.8	1/1.2	.8/1	1.1/1.5	1/1	1.2/2	1.2/1.5	2/2.5	3.5/4.5	4.5/6	5/5.5	6/7		.5/5	.5/5	.5/6	.6/8	.5/6	.6/1	.5/8	.6/1.2	.7/1.8	1/1.2	.8/1	1.1/1.5	1/1	1.2/2	1.2/1.5	2/2.5	3.5/4.5	4.5/6	5/5.5	6/7		.5/5	.5/5	.5/6	.6/8	.5/6	.6/1	.5/8	.6/1.2	.7/1.8	1/1.2	.8/1	1.1/1.5	1/1	1.2/2	1.2/1.5	2/2.5	3.5/4.5	4.5/6	5/5.5	6/7																																								

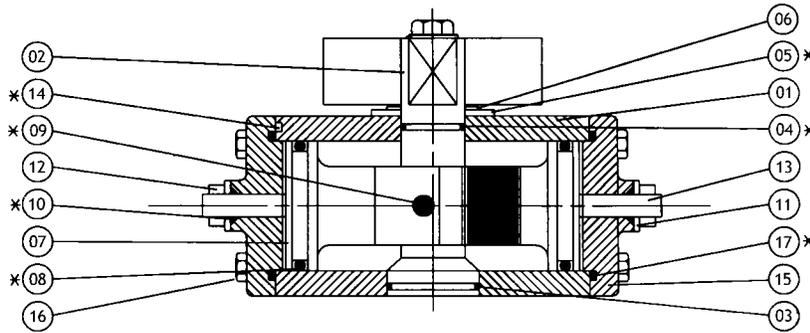
*Actuator speed open/close based on 80 psi air at no load condition.

Actuator Model	No. Springs per Piston	SIZING INFORMATION, END TORQUE (LB.-IN.)												Actuator Model	No. Springs per Piston	SIZING INFORMATION, END TORQUE (LB.-IN.)												Actuator Model	No. Springs per Piston	SIZING INFORMATION, END TORQUE (LB.-IN.)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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		40	50	60	70	80	90	40	50	60	70	80	90			40	50	60	70	80	90	40	50	60	70	80	90			40	50	60	70	80	90	40	50	60	70	80	90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	2	45	61	77	97	116	134	151	169	186	211	228	247	267	288	311	335	359	383	407	431	455	479	503	527	551	575	599	623	647	671	695	719	743	767	791	815	839	863	887	911	935	959	983	1007	1031	1055	1079	1103	1127	1151	1175	1199	1223	1247	1271	1295	1319	1343	1367	1391	1415	1439	1463	1487	1511	1535	1559	1583	1607	1631	1655	1679	1703	1727	1751	1775	1799	1823	1847	1871	1895	1919	1943	1967	1991	2015	2039	2063	2087	2111	2135	2159	2183	2207	2231	2255	2279	2303	2327	2351	2375	2399	2423	2447	2471	2495	2519	2543	2567	2591	2615	2639	2663	2687	2711	2735	2759	2783	2807	2831	2855	2879	2903	2927	2951	2975	2999	3023	3047	3071	3095	3119	3143	3167	3191	3215	3239	3263	3287	3311	3335	3359	3383	3407	3431	3455	3479	3503	3527	3551	3575	3599	3623	3647	3671	3695	3719	3743	3767	3791	3815	3839	3863	3887	3911	3935	3959	3983	4007	4031	4055	4079	4103	4127	4151	4175	4199	4223	4247	4271	4295	4319	4343	4367	4391	4415	4439	4463	4487	4511	4535	4559	4583	4607	4631	4655	4679	4703	4727	4751	4775	4799	4823	4847	4871	4895	4919	4943	4967	4991	5015	5039	5063	5087	5111	5135	5159	5183	5207	5231	5255	5279	5303	5327	5351	5375	5399	5423	5447	5471	5495	5519	5543	5567	5591	5615	5639	5663	5687	5711	5735	5759	5783	5807	5831	5855	5879	5903	5927	5951	5975	5999	6023	6047	6071	6095	6119	6143	6167	6191	6215	6239	6263	6287	6311	6335	6359	6383	6407	6431	6455	6479	6503	6527	6551	6575	6599	6623	6647	6671	6695	6719	6743	6767	6791	6815	6839	6863	6887	6911	6935	6959	6983	7007	7031	7055	7079	7103	7127	7151	7175	7199	7223	7247	7271	7295	7319	7343	7367	7391	7415	7439	7463	7487	7511	7535	7559	7583	7607	7631	7655	7679	7703	7727	7751	7775	7799	7823	7847	7871	7895	7919	7943	7967	7991	8015	8039	8063	8087	8111	8135	8159	8183	8207	8231	8255	8279	8303	8327	8351	8375	8399	8423	8447	8471	8495	8519	8543	8567	8591	8615	8639	8663	8687	8711	8735	8759	8783	8807	8831	8855	8879	8903	8927	8951	8975	8999	9023	9047	9071	9095	9119	9143	9167	9191	9215	9239	9263	9287	9311	9335	9359	9383	9407	9431	9455	9479	9503	9527	9551	9575	9599	9623	9647	9671	9695	9719	9743	9767	9791	9815	9839	9863	9887	9911	9935	9959	9983	10007	10031	10055	10079	10103	10127	10151	10175	10199	10223	10247	10271	10295	10319	10343	10367	10391	10415	10439	10463	10487	10511	10535	10559	10583	10607	10631	10655	10679	10703	10727	10751	10775	10799	10823	10847	10871	10895	10919	10943	10967	10991	11015	11039	11063	11087	11111	11135	11159	11183	11207	11231	11255	11279	11303	11327	11351	11375	11399	11423	11447	11471	11495	11519	11543	11567	11591	11615	11639	11663	11687	11711	11735	11759	11783	11807	11831	11855	11879	11903	11927	11951	11975	11999	12023	12047	12071	12095	12119	12143	12167	12191	12215	12239	12263	12287	12311	12335	12359	12383	12407	12431	12455	12479	12503	12527	12551	12575	12599	12623	12647	12671	12695	12719	12743	12767	12791	12815	12839	12863	12887	12911	12935	12959	12983	13007	13031	13055	13079	13103	13127	13151	13175	13199	13223	13247	13271	13295	13319	13343	13367	13391	13415	13439	13463	13487	13511	13535	13559	13583	13607	13631	13655	13679	13703	13727	13751	13775	13799	13823	13847	13871	13895	13919	13943	13967	13991	14015	14039	14063	14087	14111	14135	14159	14183	14207	14231	14255	14279	14303	14327	14351	14375	14399	14423	14447	14471	14495	14519	14543	14567	14591	14615	14639	14663	14687	14711	14735	14759	14783	14807	14831	14855	14879	14903	14927	14951	14975	14999	15023	15047	15071	15095	15119	15143	15167	15191	15215	15239	15263	15287	15311	15335	15359	15383	15407	15431	15455	15479	15503	15527	15551	15575	15599	15623	15647	15671	15695	15719	15743	15767	15791	15815	15839	15863	15887	15911	15935	15959	15983	16007	16031	16055	16079	16103	16127	16151	16175	16199	16223	16247	16271	16295	16319	16343	16367	16391	16415	16439	16463	16487	16511	16535	16559	16583	16607	16631	16655	16679	16703	16727	16751	16775	16799	16823	16847	16871	16895	16919	16943	16967	16991	17015	17039	17063	17087	17111	17135	17159	17183	17207	17231	17255	17279	17303	17327	17351	17375	17399	17423	17447	17471	17495	17519	17543	17567	17591	17615	17639	17663	17687	17711	17735	17759	17783	17807	17831	17855	17879	17903	17927	17951	17975	17999	18023	18047	18071	18095	18119	18143	18167	18191	18215	18239	18263	18287	18311	18335	18359	18383	18407	18431	18455	18479	18503	18527	18551	18575	18599	18623	18647	18671	18695	18719	18743	18767	18791	18815	18839	18863	18887	18911	18935	18959	18983	19007	19031	19055	19079	19103	19127	19151	19175	19199	19223	19247	19271	19295	19319	19343	19367	19391	19415	19439	19463	19487	19511	19535	19559	19583	19607	19631	19655	19679	19703	19727	19751	19775	19799	19823	19847	19871	19895	19919	19943	19967	19991	20015	20039	20063	20087	20111	20135	20159	20183	20207	20231	20255	20279	20303	20327	20351	20375	20399	20423	20447	20471	20495	20519	20543	20567	20591	20615	20639	20663	20687	20711	20735	20759	20783	20807	20831	20855	20879	20903	20927	20951	20975	20999	21023	21047	21071	21095	21119	21143	21167	21191	21215	21239	21263	21287	21311	21335	21359	21383	21407	21431	21455	21479	21503	21527	21551	21575	21599	21623	21647	21671	21695	21719	21743	21767	21791	21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Apollo® CompactTorque™ Spring Return (Start Stroke) Torque Ratings

Actuator Model	No. Springs per Piston	SIZING INFORMATION, START TORQUE (LB.-IN.)												Spring Stroke									
		AIR SUPPLY AVAILABLE AT ACTUATOR																					
		40		50		60		70		80		90			100		110		120				
Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start	Start		
3TS-020-XX	2	52	69	86	106	125	143	160	177	194	30	795	1048	1300	1586	1871	2130	2389	2646	2902	473		
	2/3	47	64	81	100	120	137	155	172	189	37	726	974	1222	1512	1802	2058	2315	2569	2824	593		
	3	42	59	75	95	115	132	149	166	183	44	657	901	1144	1439	1733	1987	2240	2493	2746	712		
	3/4										51										830		
	4										58											947	
	4/5										66												1067
3TS-030-XX	5									74												1186	
	5/6									82												1306	
	6									89												1425	
	2	96	127	157	191	225	256	287	319	350	54	1066	1398	1730	2106	2482	2819	3156	3501	3845	611		
	2/3	88	118	148	182	217	248	278	309	341	68	981	1307	1634	2015	2397	2731	3065	3407	3749	762		
	3	80	109	138	174	209	239	269	300	331	81	895	1217	1538	1925	2311	2642	2973	3313	3652	912		
3TS-040-XX	3/4									94												1063	
	4									107												1213	
	4/5									121												1368	
	5									135												1522	
	5/6									148												1673	
	6									161													1823
3TS-040-XX	2	208	273	337	410	482	548	614	681	747	118	2091	2744	3396	4127	4858	5528	6198	6871	7543	1177		
	2/3	191	255	318	392	465	531	596	662	728	148	1920	2562	3204	3946	4687	5351	6015	6683	7351	1469		
	3	174	237	299	374	448	513	578	644	709	177	1749	2381	3012	3764	4516	5174	5832	6495	7158	1761		
	3/4									207												2058	
	4									236													2354
	4/5									266													2646
3TS-050-XX	5									296												2938	
	5/6									326												3235	
	6									355												3531	
	2	319	417	515	626	736	837	937	1039	1141	185	3889	5127	6365	7723	9080	10333	11586	12851	14115	2230		
	2/3	295	391	488	600	712	811	911	1012	1114	231	3563	4771	5979	7367	8755	9996	11237	12493	13749	2788		
	3	270	365	460	574	687	786	885	986	1086	277	3238	4416	5593	7011	8429	9659	10888	12135	13382	3346		
3TS-060-XX	3/4									323												3904	
	4									369												4461	
	4/5									415												5019	
	5									461												5576	
	5/6									507												6134	
	6									553													6691
3TS-060-XX	2	491	644	796	967	1138	1296	1454	1614	1774	280	9373	12325	15277	18635	21993	25032	28071	31139	34207	5443		
	2/3	452	602	752	925	1098	1255	1412	1570	1729	350	8564	11465	14367	17775	21184	24194	27204	30250	33296	6806		
	3	412	560	707	883	1058	1214	1369	1527	1684	419	7754	10605	13456	16915	20374	23355	26336	29361	32385	8169		
	3/4									489												9528	
	4									558													10886
	4/5									628													12249
3TS-060-XX	5									697												14971	
	5/6									767													16330
	6									836													18233
	2	863	1011	1160	1308	1456	1601	1749	1897	2045	969	15508	20117	24726	29335	33944	38553	43162	47771	52380	56989	61598	
	2/3	822	969	1116	1263	1410	1557	1704	1851	1998	969	15508	20117	24726	29335	33944	38553	43162	47771	52380	56989	61598	
	3	822	969	1116	1263	1410	1557	1704	1851	1998	969	15508	20117	24726	29335	33944	38553	43162	47771	52380	56989	61598	

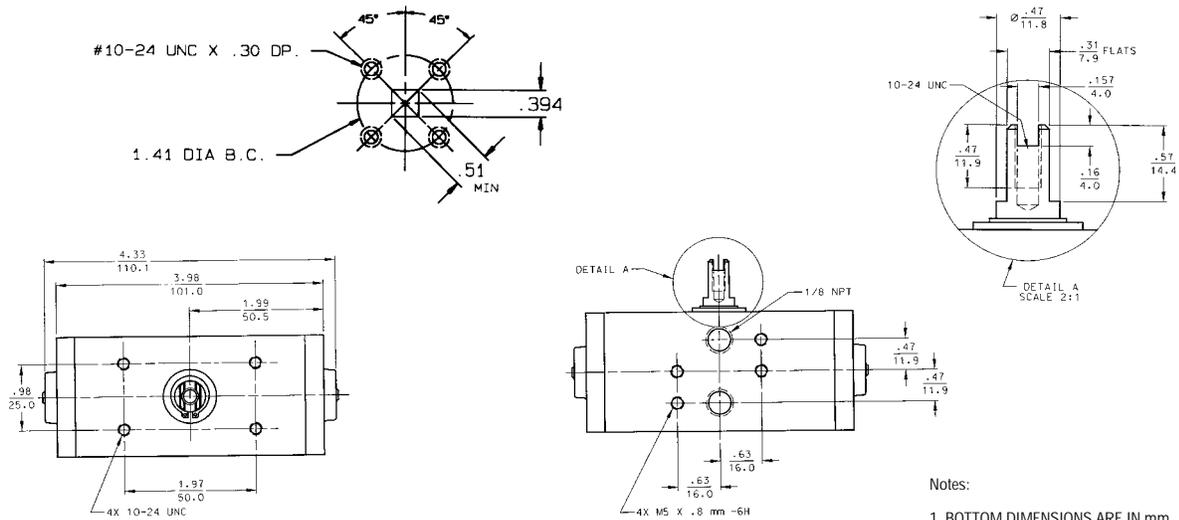
Apollo® CompactTorque™ 3TD-010-00



** Suggested spare parts; Included in repair kit
Factory lubricated with IMSCO poly U-II grease
Rebuild with High temp, disk brake, wheel bearing grease*

Actuator Temperature Limits

Nitrile (Buna) seals: -20°F to +200°F



Notes:
1. BOTTOM DIMENSIONS ARE IN mm

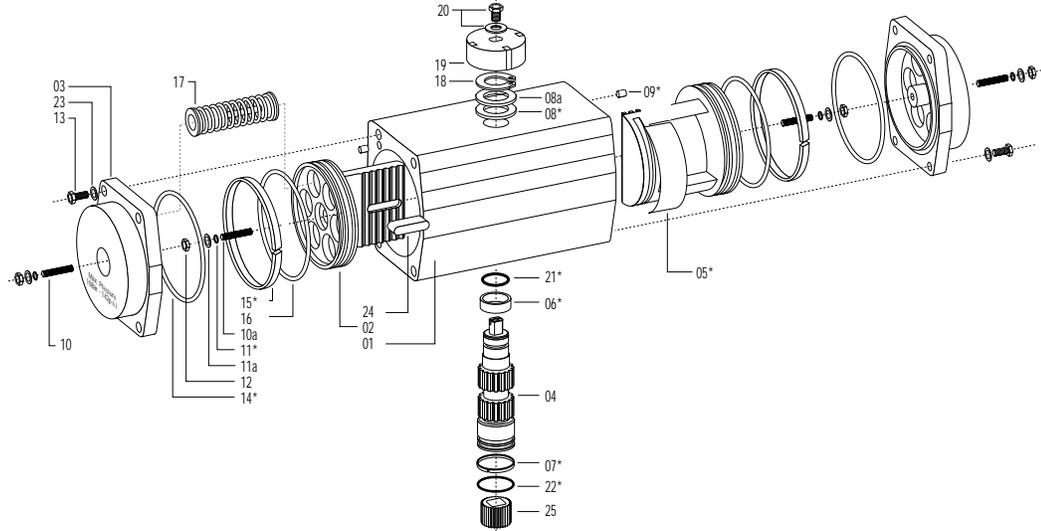
AIR SUPPLY PSIG	40	50	60	70	80	90	100	120
TORQUE Lb. In.	29.3	36.6	44	51.3	58.6	66	73.3	88

3TD-010-00 Parts List

ITEM	DESCRIPTION	MATERIAL	TREATMENT	UNIT QTY.
1	Body	Extruded Aluminum Alloy	Hard Anodized	1
2	Pinion	High Strength Alloy Steel	Nickel Plated	1
*3	O-Ring (Lower Pinion)	Nitrile (Buna-N)	N/A	1
*4	O-Ring (Upper Pinion)	Nitrile (Buna-N)	N/A	1
*5	Thrust Bearing (Pinion)	Nylon 4-6	N/A	1
6	Retaining Ring (Pinion)	Stainless Steel	N/A	1
7	Piston	Die Cast Aluminum	N/A	2
*8	O-Ring (Piston)	Nitrile (Buna-N)	N/A	2
*9	Bearing (Piston)	Nylon 4-6	N/A	2
*10	O-Ring (Adjustment Screw)	Nitrile (Buna-N)	N/A	2
11	Washer (Adjustment Screw)	Stainless Steel	N/A	2
12	Nut (Adjustment Screw)	Stainless Steel	N/A	2
13	Adjustment Screw	Stainless Steel	N/A	2
14	Left End Cap	Die Cast Aluminum	Powder Coat	1
15	Right End Cap	Die Cast Aluminum	Powder Coat	1
16	Screw (End Cap)	Stainless Steel	N/A	8
*17	O-Ring (End Cap)	Nitrile (Buna-N)	N/A	2

*Suggested spare parts; Included in repair kit (3TK-210-00).

Materials of Construction and Operation



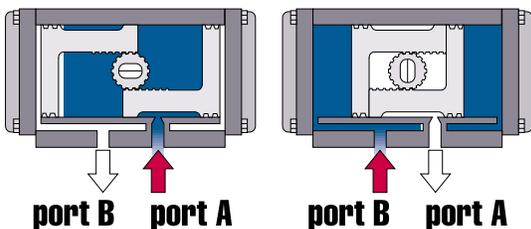
CompacTorque Part Number Designations

Part #	Unit Qty.	Part Description	Material	Specifications	Optional Materials	Protection
01	1	Body	Extruded aluminum alloy	ASTM 6063 T6		A, B, C, D, E, F
02	2	Piston	Aluminum	ASTM B179-DIN 1725/5		
03	2	End caps	Aluminum alloy	ASTM B179-DIN 1725/5		C, D, E, F
04	1	Drive shaft	Steel alloy	AISI 1144	SS	Nickel plated
05*	2	Bearing (piston back)	Nylon 46			
06*	1	Bearing (pinion top)	Nylon 46			
07*	1	Bearing (pinion bottom)	Nylon 46			
08*	1	Thrust bearing (pinion)	Polyphthalamide (PPA)			
08a	1	Thrust washer (pinion)	SS	AISI 304		
09*	2	Plug (transfer port)	Nitrile (NBR)		For extreme temperature	
10	2	Screw (ext. stroke adj.)	SS	18-8		
10a	1	Screw (int. stroke adj.)	SS	18-8		
11*	4	O-Ring (screw seal)	Nitrile (NBR)		For extreme temperature	
11a	4	Washer (seal)	SS	AISI 304		
12	4	Nut (stop adjustment)	SS	18-8		
13	8	Cap screw (end cap)	SS	18-8		
14*	2	O-Ring (end cap)	Nitrile (NBR)		For extreme temperature	
15*	2	Bearing (piston head)	Nylon 46			
16*	2	O-Ring (piston head)	Nitrile (NBR)		For extreme temperature	
17	12 (max)	Spring (cartridge)	High alloy spring steel			Polyester powder coating Nickel plated
18	1	Spring clip (pinion)	High alloy spring steel			
19**	1	Position indicator	Polyamide			
20**	1	Cap screw/washer	SS	18-8		
21*	1	O-Ring (pinion top)	Nitrile (NBR)		For extreme temperature	
22*	1	O-Ring (pinion bottom)	Nitrile (NBR)		For extreme temperature	
23	8	Washer (cap screw)	SS	18-8		
24***	2	Piston guide	Polyphthalamide (PPA)			
25	1	Universal shaft adapter	Sintered metal	FLN-4205-40	SS	

NOTES: (1) *Suggested spare parts; included in repair kit. Factory lubricated w/IMSCO poly U-11 grease. Rebuild w/ high temperature disc brake wheel bearing grease. Actuator temp. limits: Nitrile (BUNA) seals: -20°F to +200°F (2) ** Optional. (3) Model OAO Part No. 23 and 13 unit quantity is 12 pieces. (3) *** 3T 010 thru 3T 060 is cast onto piston

Diagram 3

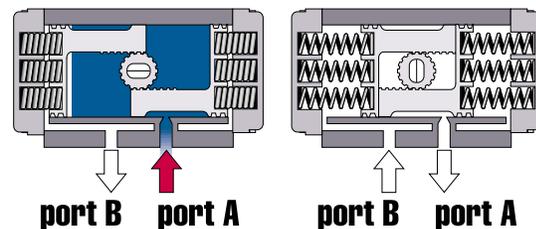
Double-Acting (TOP VIEW)



port B port A
Air supplied to port A forces pistons apart and toward end positions with exhaust air exiting at port B. (A CW rotation is obtained.)

port B port A
Air supplied to port B forces pistons toward center with exhaust air exiting at port A. (A CW rotation is obtained.)

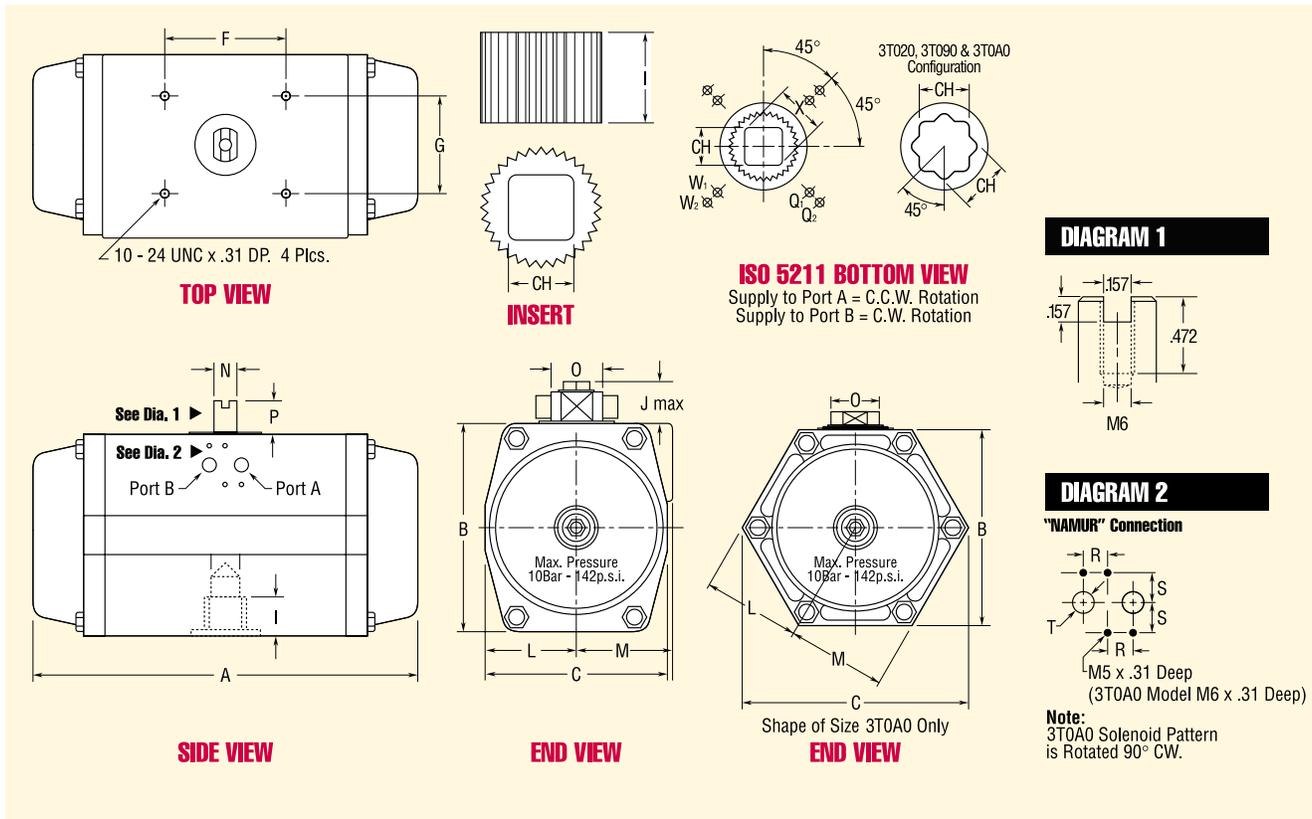
Spring Return (TOP VIEW)



port B port A
Air supplied to port A forces pistons apart and toward end position compressing springs. Exhaust air exits at port B. (A CW rotation is obtained.)

port B port A
Air or electric failure allows springs to force pistons toward center position with exhaust air exiting at port A. (A CW rotation is obtained.)

Engineering



Dimensions										
	3T-20	3T-30	3T-40	3T-50	3T-60	3T-65	3T-70	3T-80	3T-90	3T-0A
A	5.30	5.98	7.95	9.05	10.66	12.13	14.17	18.18	22.60	26.93
B	2.63	3.26	3.93	4.33	4.92	5.59	6.10	7.70	9.44	13.00
C	2.28	2.87	3.34	3.85	4.33	5.04	5.51	6.92	8.66	13.78
F	1.97	3.15	3.15	3.15	3.15	5.12	5.12	5.12	5.12	5.12
G	.98	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18
I	.51	.59	.748	.94	1.18	1.18	1.18	1.45	1.96	1.97
J	1.00	1.00	1.00	1.00	1.00	1.38	1.42	1.42	1.42	1.42
L	1.14	1.44	1.67	1.93	2.16	2.68	2.75	3.46	4.33	6.04
M	1.45	1.61	1.81	2.08	2.36	2.52	2.87	3.58	4.33	6.32
N	.31	.31	.55	.55	.55	1.06	1.06	1.06	1.26	2.16
O	.47	.47	.70	.70	.70	1.42	1.42	1.42	1.66	3.15
P	.78	.78	.78	.78	.78	1.18	1.18	1.18	1.18	1.18
R	.47	.47	.47	.47	.47	.47	.47	.47	.47	.65
S	.63	.63	.63	.63	.63	.63	.63	.63	.63	.75
T-NPT	1/8"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/2"
Q1-Q2 DIA B.C.	1.65	1.97	1.97-2.75	1.97-2.75	2.75-4.01	2.75-4.01	2.75-4.01	4.01-4.92	5.51	6.50
CH	.43/11mm	.43/11mm	.55/14mm	.748/19mm	.748/19mm	.86/22mm	.86/22mm	1.06/27mm	1.41/36mm	1.81
X MIN.	.55	.55	.71	.87	.87	1.11	1.11	1.42	1.89	2.46
W1 THD x *Y* DEEP	1/4-20X.31	1/4-20X.33	1/4-20X.39	1/4-20X.35	5/16-18X.39	5/16-18X.39	5/16-18X.39	3/8-16X.47	5/8-11X.78	3/4-10X.90
W2 THD x *Y* DEEP	—	—	5/16-18X.47	5/16-18X.47	3/8-16X.47	3/8-16X.47	3/8-16X.47	1/2-13X.59	—	—
ISO 5211	F04*	F05*	F05*-F07	F05-F07*	F07*-F10	F07-F10*	F07-F10*	F10-F12*	F14*	F16*

* F pattern Consistent with Conbraco's Mounting Bracket
 ** Alternate ISO 5211 Dimension Utilized
 *** Rev. B = 4.921/4.015 Dia. B.C.