



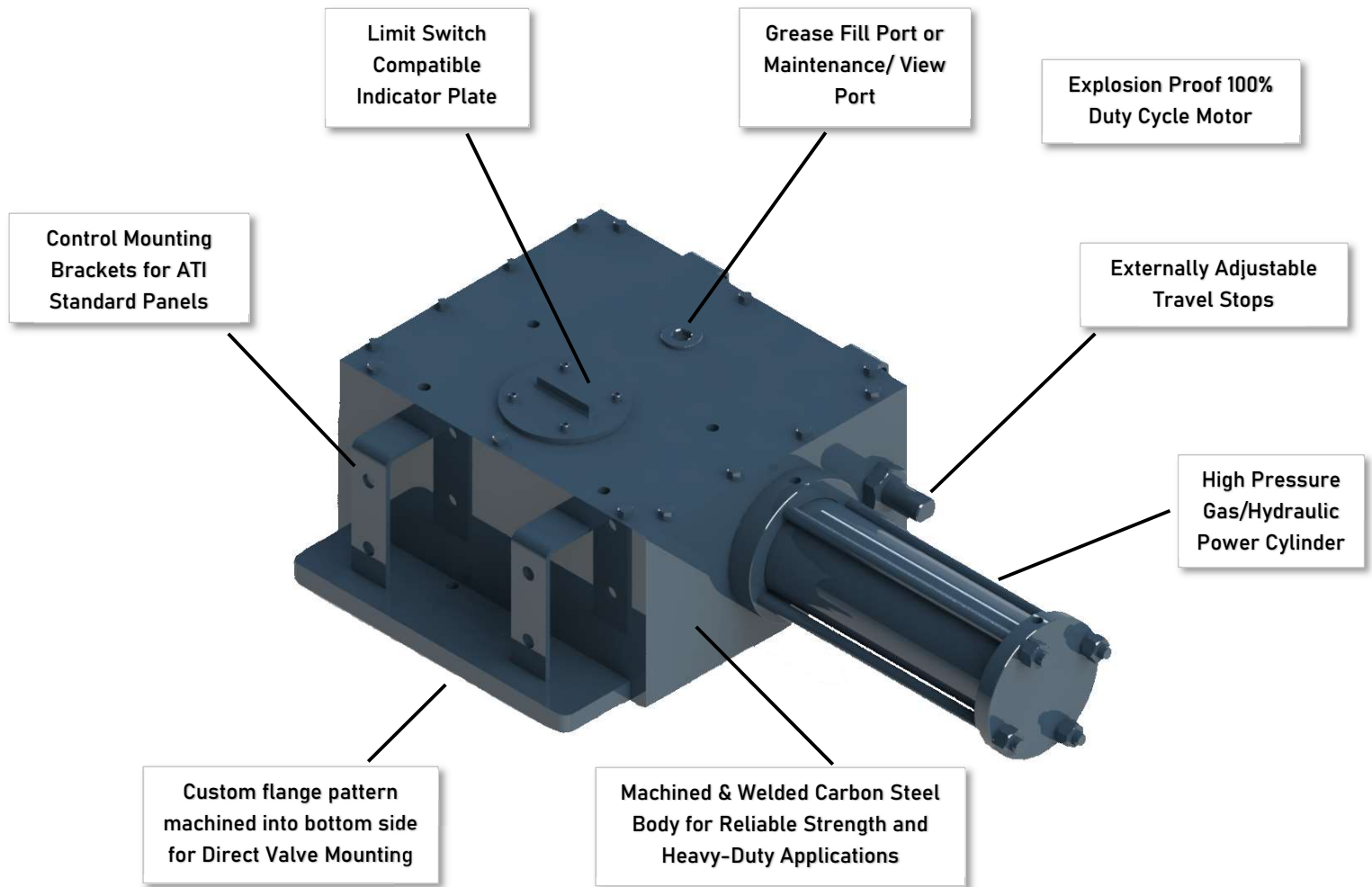
SCOTCH YOKE QUARTER-TURN ACTUATORS

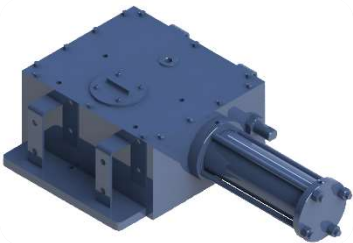
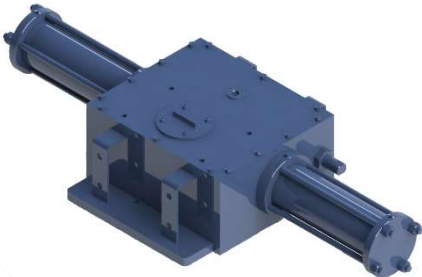
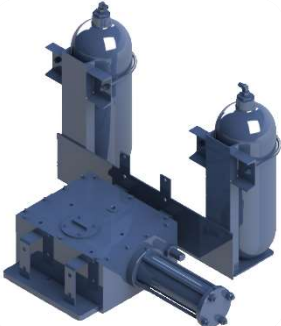


Scotch Yoke Quarter-Turn Actuators

Product Description

The ATI Double Acting Scotch Yoke series delivers a robust, reliable design with easy installation and low maintenance requirements. Designed for a wide range of torques, this product provides both reliability and a lower cost than an equivalent quarter-turn actuator. The Double Acting Scotch Yoke comes in three standardized configurations: Hydraulic, Gas Over Oil and Direct Gas. These configurations provide the end-user with many different failure modes and control options.

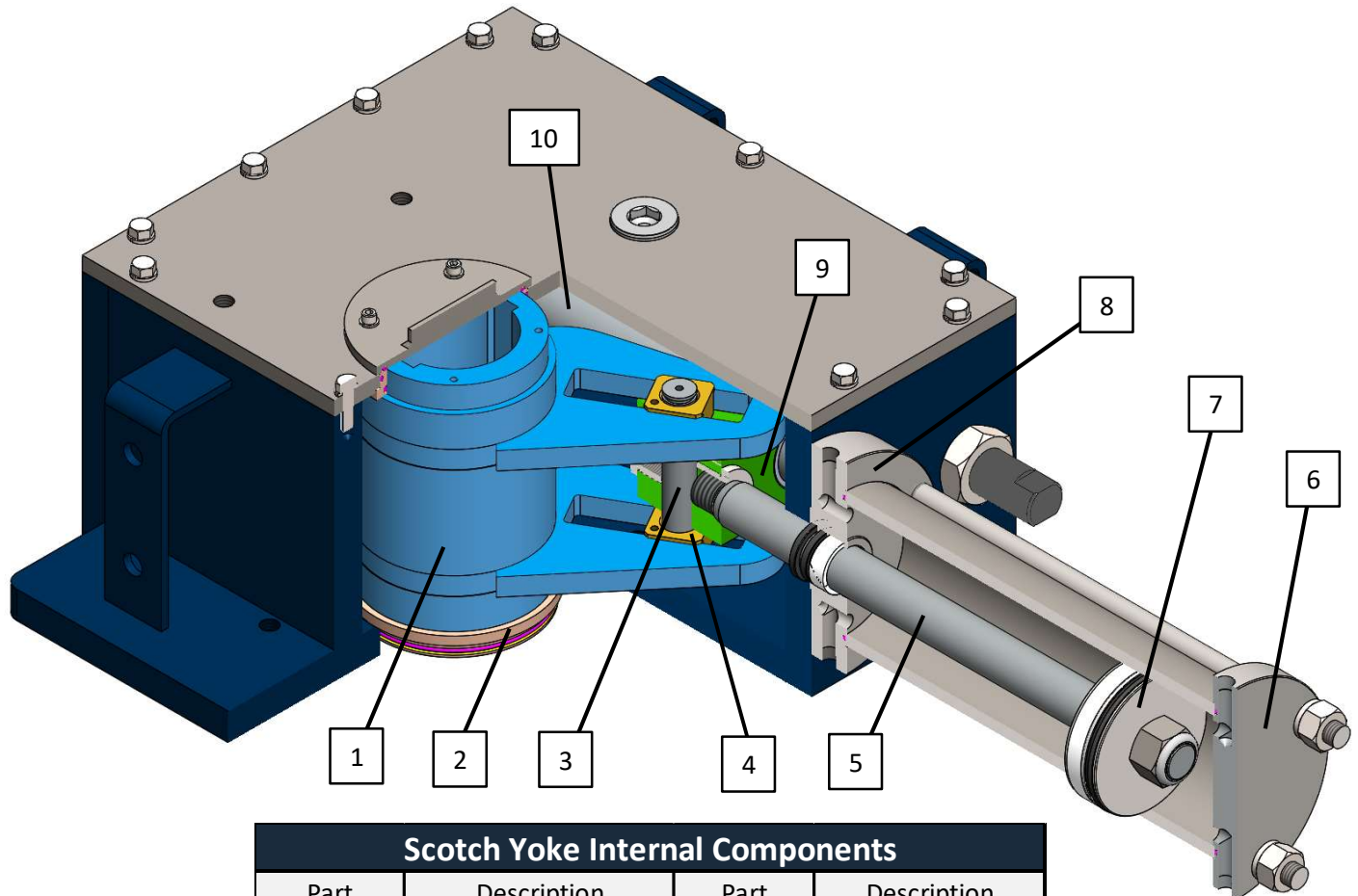


Hydraulic	Direct Gas	Gas-Over-Oil
		



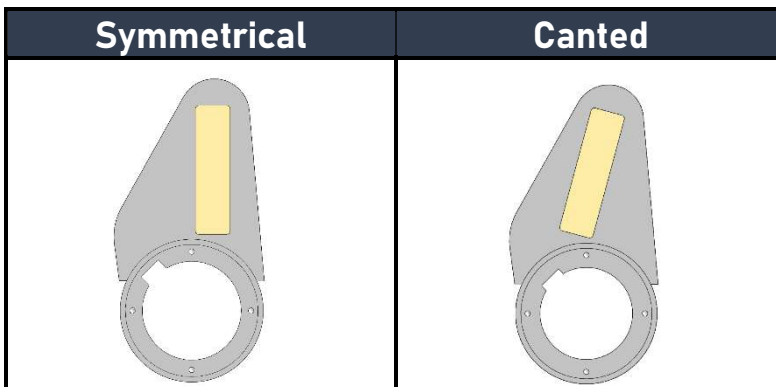
Scotch Yoke Quarter-Turn Actuators

Internal Components



Scotch Yoke Internal Components			
Part	Description	Part	Description
1	Yoke	6	Outside End Cap
2	Yoke Bushing	7	Piston
3	Guide Block Pin	8	Inside End Cap
4	Sliding Block	9	Guide Block
5	Piston Rod	10	Guide Bar

Yoke Designs



Symmetrical

The symmetrical design produces BTO & ETC Torque values that are similar. This design is advantageous for valves with similar torque requirements to open and close.

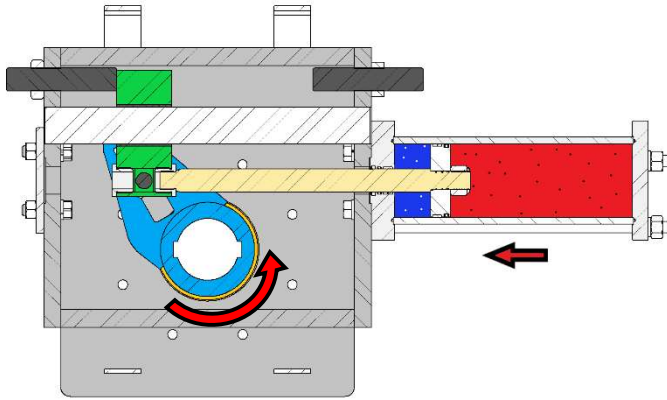
Canted

The canted design produces a BTO that is much greater than the ETC but also produces a lower run torque than a symmetrical design. The canted yoke is preferred for valves with low run torque requirements and high BTO requirements.



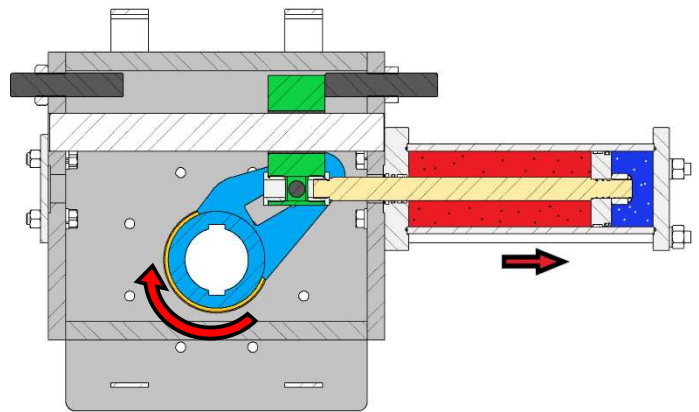
Scotch Yoke Quarter-Turn Actuators

Hydraulic Operation



OPEN Direction

(Actuator shown in Fully Opened Position)

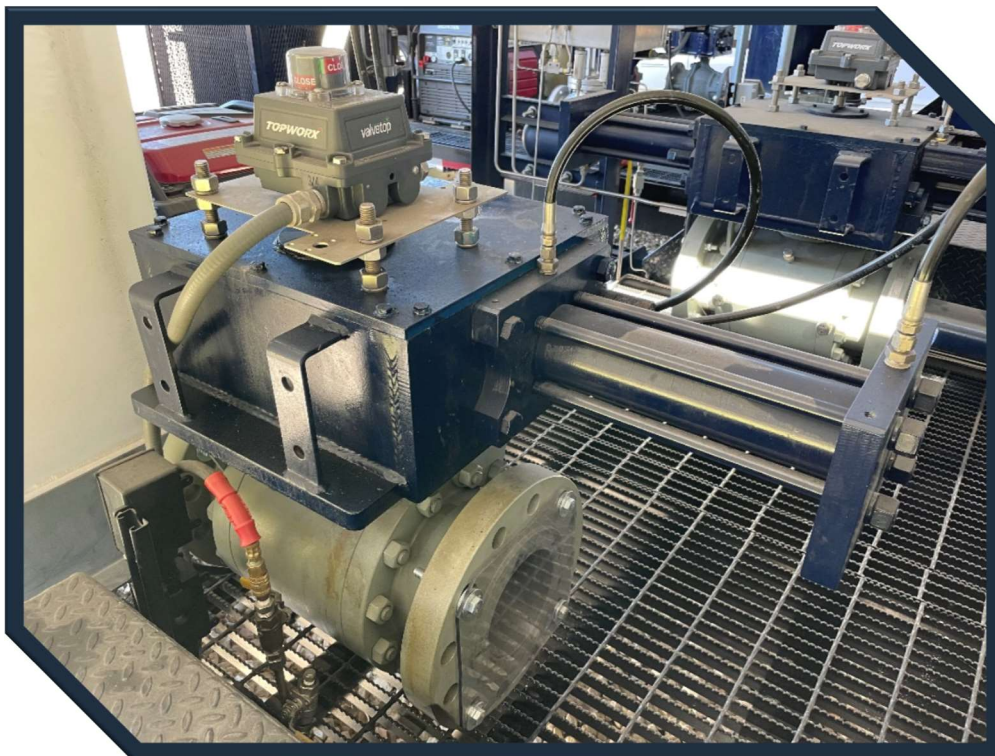


CLOSE Direction

(Actuator shown in Fully Closed Position)

Hydraulic Operation Description:

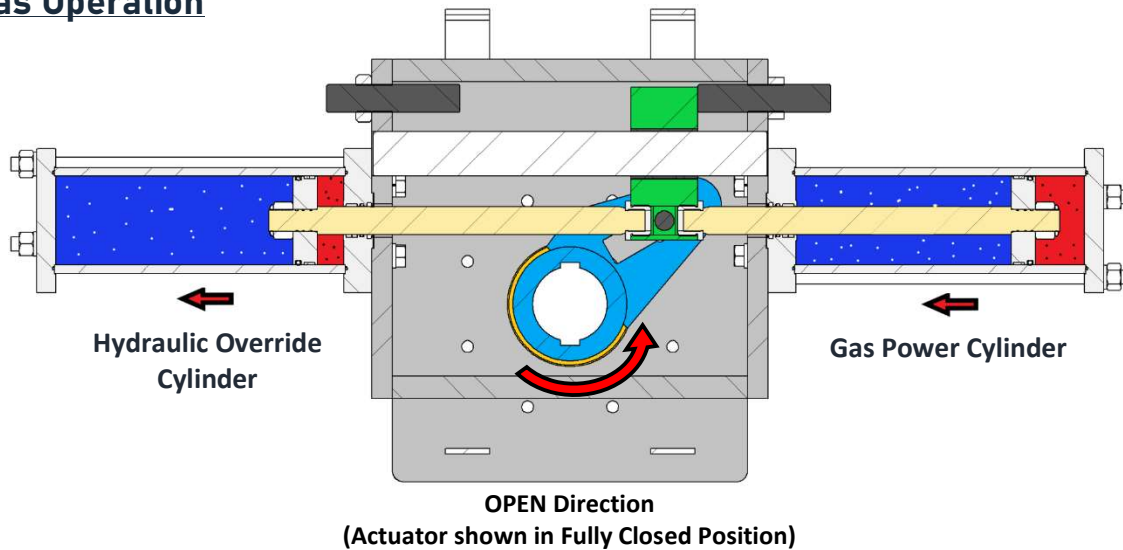
- **To Open:** Pressure is supplied to the outside end cap (OEC) of the high-pressure cylinder while fluid is exhausted through the inside end cap (IEC). The pressure on the piston area transfers force to the yoke arm with the piston rod. The applied torque to the Yoke will rotate the valve stem counter-clockwise until the adjustable stop is reached or valve is fully opened.
- **To Close:** Pressure is supplied to the IEC of the high-pressure cylinder while fluid is exhausted through the OEC. The pressure on the piston area transfers force to the yoke arm with the piston rod. The applied torque to the Yoke will rotate the valve stem clockwise until the adjustable stop is reached or valve is fully closed.





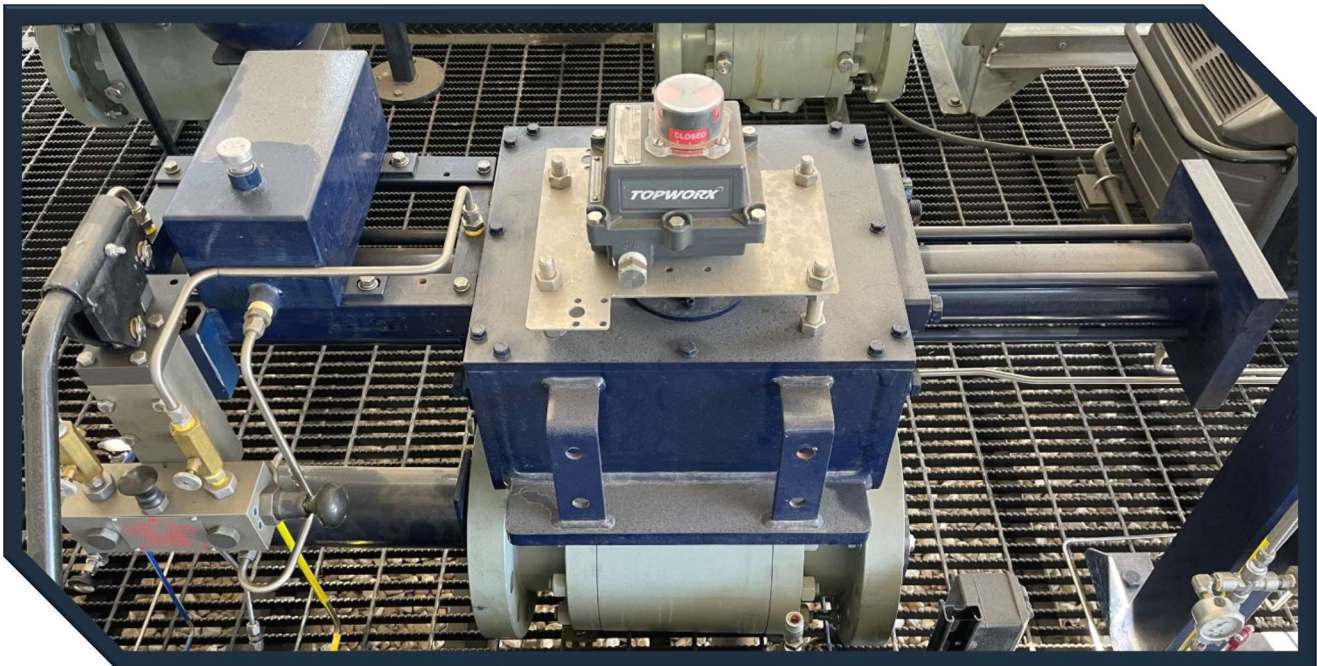
Scotch Yoke Quarter-Turn Actuators

Direct-Gas Operation



Direct Gas Operation Description:

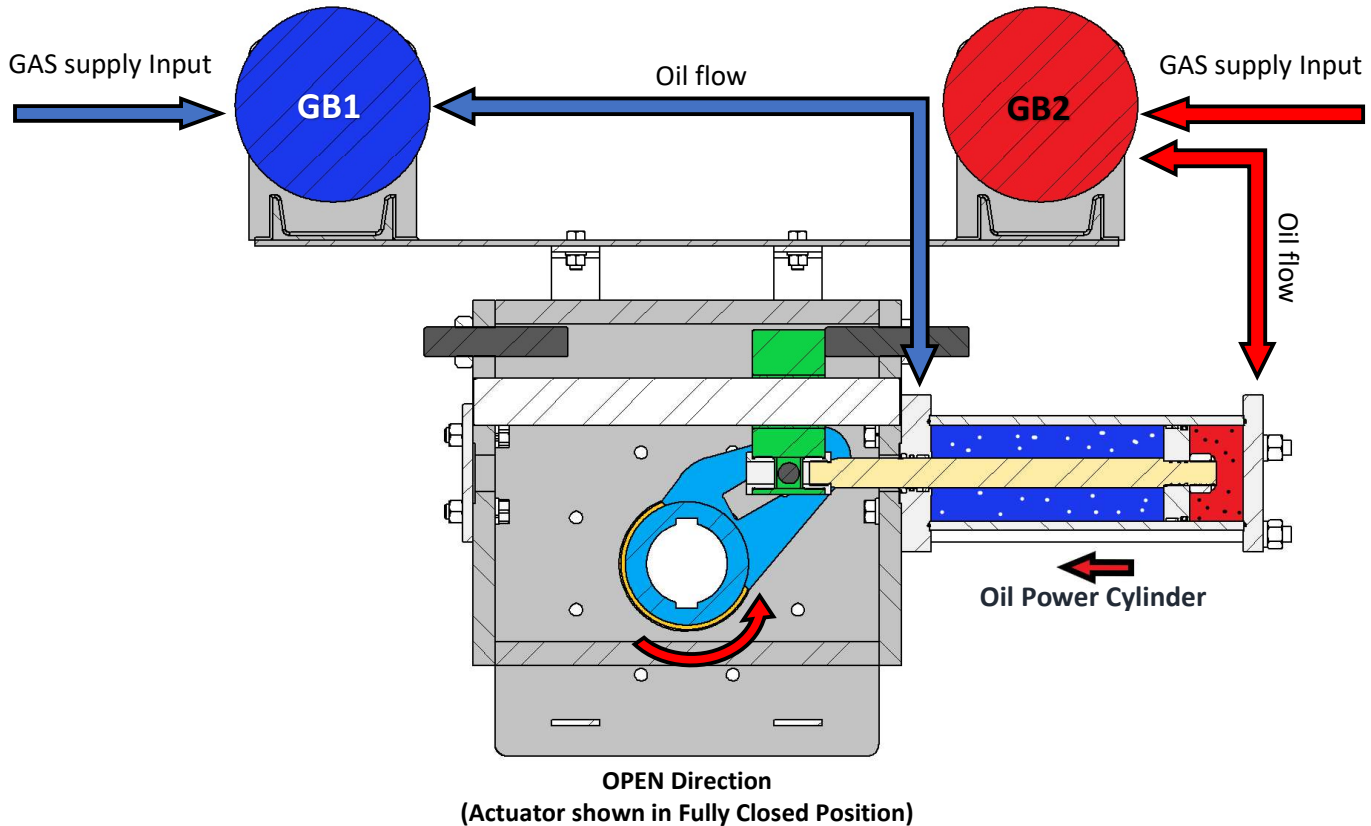
- **To Open:** Pressure is supplied to the OEC of the Gas Power Cylinder or the IEC of the Hydraulic Cylinder, while fluid is exhausted through the IEC of Gas Power cylinder and OEC of Hydraulic Cylinder. The pressure on the piston area transfers force to the yoke arm with the piston rod. The applied torque to the Yoke will rotate the valve stem counter-clockwise until the adjustable stop is reached or valve is fully opened.
- **To Close:** Pressure is supplied to the IEC of the Gas Power Cylinder or the OEC of the Hydraulic Cylinder, while fluid is exhausted through the OEC of Gas Power cylinder and IEC of Hydraulic Cylinder. The pressure on the piston area transfers force to the yoke arm with the piston rod. The applied torque to the Yoke will rotate the valve stem clockwise until the adjustable stop is reached or valve is fully closed.





Scotch Yoke Quarter-Turn Actuators

Gas-Over-Oil Operation



Gas-Over-Oil Operation Description:

- **To Open:** Gas Pressure is supplied to the top of GB2 (GB = Gas Bottle) which pressurizes the hydraulic oil in the bottom of GB2 and forces oil into the OEC of the Power Cylinder. Gas pressure is also relieved out of GB1 allowing oil from IEC of power cylinder to flow back into GB1. The pressure difference across the piston will move piston leftward, rotating the actuator/valve open.
- **To Close:** Gas Pressure is supplied to the top of GB1 which pressurizes the hydraulic oil in the bottom of GB1 and forces oil into the IEC of the Power Cylinder. Gas pressure is also relieved out of GB2 allowing oil from OEC of power cylinder to flow back into GB2. The pressure difference across the piston will move piston rightward, rotating the actuator/valve close.





Scotch Yoke Quarter-Turn Actuators

Double Acting Torque Values (Symmetrical Yoke)

ATI Model	Torque (in-lbf)	Supply Pressure											
		400 psi	500 psi	600 psi	700 psi	800 psi	900 psi	1000 psi	1100 psi	1200 psi	1300 psi	1400 psi	1500 psi
SYS1-3.2	BTO	13,979	17,505	21,031	24,557	28,082	31,608	35,134	38,659	42,185	45,711	49,236	52,762
	Min	6,971	8,729	10,487	12,245	14,003	15,761	17,519	19,277	21,035	22,793	24,551	26,310
	ETC	11,911	14,916	17,920	20,924	23,928	26,932	29,936	32,940	35,945	38,949	41,953	44,957
SYS1-4.0	BTO	21,176	26,517	31,857	37,198	42,539	47,879	53,220	58,561	63,902	69,242	74,583	79,924
	Min	11,182	14,002	16,823	19,643	22,463	25,283	28,104	30,924	33,744	36,564	39,385	42,205
	ETC	19,108	23,927	28,746	33,565	38,385	43,204	48,023	52,842	57,661	62,480	67,299	72,119
SYS2-3.2	BTO	21,117	26,403	31,688	36,974	42,260	47,546	52,832	58,117	63,403	68,689	73,975	79,261
	Min	9,249	11,564	13,879	16,194	18,509	20,824	23,139	25,454	27,769	30,084	32,399	34,715
	ETC	17,993	22,497	27,001	31,505	36,009	40,512	45,016	49,520	54,024	58,528	63,032	67,536
SYS2-4.0	BTO	31,988	39,995	48,001	56,008	64,015	72,022	80,029	88,036	96,043	104,050	112,057	120,064
	Min	14,836	18,550	22,264	25,978	29,692	33,405	37,119	40,833	44,547	48,260	51,974	55,688
	ETC	28,864	36,089	43,314	50,539	57,764	64,989	72,214	79,439	86,664	93,889	101,114	108,339
SYS2-5.0	BTO	49,981	62,491	75,002	87,513	100,024	112,535	125,045	137,556	150,067	162,578	175,089	187,599
	Min	24,085	30,114	36,143	42,172	48,201	54,229	60,258	66,287	72,316	78,345	84,374	90,402
	ETC	46,857	58,586	70,315	82,043	93,772	105,501	117,230	128,959	140,688	152,417	164,146	175,874
SYS3-3.2	BTO	36,350	45,449	54,548	63,647	72,746	81,845	90,944	100,043	109,142	118,241	127,340	136,439
	Min	15,459	19,329	23,198	27,068	30,938	34,807	38,677	42,547	46,416	50,286	54,156	58,025
	ETC	30,973	38,726	46,479	54,232	61,985	69,738	77,491	85,244	92,997	100,750	108,503	116,256
SYS3-4.0	BTO	55,063	68,846	82,629	96,412	110,195	123,978	137,762	151,545	165,328	179,111	192,894	206,677
	Min	24,799	31,007	37,214	43,422	49,629	55,837	62,044	68,252	74,459	80,667	86,875	93,082
	ETC	49,686	62,123	74,560	86,997	99,434	111,871	124,308	136,745	149,182	161,619	174,056	186,493
SYS3-5.0	BTO	86,036	107,572	129,108	150,644	172,180	193,716	215,252	236,788	258,324	279,860	301,396	
	Min	40,258	50,335	60,413	70,490	80,567	90,644	100,721	110,799	120,876	130,953	141,030	
	ETC	80,659	100,849	121,039	141,229	161,419	181,609	201,799	221,989	242,179	262,369	282,559	
SYS3-6.0	BTO	123,892	154,904	185,916	216,928	247,940	278,952	309,963					
	Min	54,966	68,725	82,483	96,242	110,001	123,760	137,518					
	ETC	110,127	137,693	165,259	192,825	220,391	247,957	275,523					
SYS6-4.0	BTO	62,597	78,266	93,935	109,604	125,273	140,942	156,611	172,280	187,949	203,618	219,287	234,956
	Min	25,609	32,019	38,429	44,839	51,250	57,660	64,070	70,480	76,890	83,301	89,711	96,121
	ETC	50,616	63,286	75,956	88,625	101,295	113,965	126,635	139,305	151,974	164,644	177,314	189,984
SYS6-5.0	BTO	97,808	122,291	146,774	171,257	195,739	220,222	244,705	269,188	293,670	318,153	342,636	367,119
	Min	41,568	51,973	62,378	72,783	83,188	93,593	103,998	114,403	124,808	135,213	145,618	156,023
	ETC	82,159	102,725	123,290	143,856	164,421	184,987	205,552	226,118	246,683	267,249	287,814	308,380
SYS6-6.0	BTO	140,844	176,099	211,354	246,610	281,865	317,120	352,375	387,630	422,885	458,140	493,396	
	Min	63,342	79,197	95,052	110,907	126,762	142,618	158,473	174,328	190,183	206,038	221,894	
	ETC	125,195	156,533	187,871	219,209	250,546	281,884	313,222	344,560	375,898	407,236	438,574	
SYS6-7.0	BTO	191,705	239,691	287,677	335,663	383,649	431,635	479,622					
	Min	85,827	107,310	128,794	150,277	171,761	193,244	214,728					
	ETC	169,637	212,099	254,561	297,023	339,486	381,948	424,410					
SYS6-8.0	BTO	250,390	313,066	375,741	438,417	501,093							
	Min	115,518	144,434	173,349	202,265	231,180							
	ETC	228,322	285,474	342,625	399,777	456,929							
SYS14-8.0	BTO	274,694	343,453	412,213	480,972	549,731	618,491	687,250	756,010	824,769	893,528	962,288	1,031,047
	Min	126,692	158,405	190,118	221,831	253,543	285,256	316,969	348,682	380,395	412,107	443,820	475,533
	ETC	250,484	313,183	375,882	438,582	501,281	563,980	626,679	689,379	752,078	814,777	877,477	940,176
SYS14-10.0	BTO	429,209	536,646	644,082	751,519	858,955	966,392						
	Min	204,845	256,120	307,396	358,671	409,946	461,222						
	ETC	404,999	506,375	607,752	709,128	810,505	911,881						
SYS14-12.0	BTO	618,061	772,770	927,478									
	Min	293,072	366,431	439,791									
	ETC	579,432	724,472	869,511									



Scotch Yoke Quarter-Turn Actuators

Double Acting Torque Values (Canted Yoke)

ATI Model	Torque (in-lbf)	Supply Pressure											
		400 psi	500 psi	600 psi	700 psi	800 psi	900 psi	1000 psi	1100 psi	1200 psi	1300 psi	1400 psi	1500 psi
SYC2-3.2	BTO	26,256	32,828	39,400	45,972	52,544	59,116	65,688	72,260	78,832	85,404	91,977	98,549
	Min	8,980	11,228	13,476	15,724	17,972	20,220	22,468	24,716	26,964	29,212	31,460	33,708
	ETC	21,556	26,952	32,347	37,743	43,139	48,535	53,930	59,326	64,722	70,118	75,513	80,909
SYC2-4.0	BTO	39,772	49,727	59,682	69,638	79,593	89,549	99,504	109,459	119,415	129,370	139,325	149,281
	Min	13,398	16,752	20,105	23,459	26,813	30,166	33,520	36,874	40,227	43,581	46,935	50,288
	ETC	32,159	40,209	48,259	56,309	64,359	72,408	80,458	88,508	96,558	104,608	112,658	120,707
SYC2-5.0	BTO	62,143	77,699	93,254	108,809	124,364	139,920	155,475	171,030	186,585	202,141		
	Min	21,747	27,191	32,635	38,078	43,522	48,966	54,409	59,853	65,296	70,740		
	ETC	52,200	65,267	78,333	91,400	104,466	117,532	130,599	143,665	156,732	169,798		
SYC3-3.2	BTO	45,964	57,470	68,975	80,480	91,986	103,491	114,997	126,502	138,007	149,513	161,018	172,524
	Min	15,272	19,095	22,918	26,741	30,564	34,387	38,210	42,033	45,855	49,678	53,501	57,324
	ETC	37,737	47,183	56,629	66,075	75,521	84,967	94,413	103,859	113,305	122,751	132,197	141,643
SYC3-4.0	BTO	69,626	87,054	104,483	121,911	139,339	156,768	174,196	191,624	209,053	226,481	243,909	261,338
	Min	22,785	28,488	34,191	39,895	45,598	51,301	57,005	62,708	68,411	74,115	79,818	85,521
	ETC	56,299	70,392	84,484	98,577	112,669	126,761	140,854	154,946	169,039	183,131	197,224	211,316
SYC3-5.0	BTO	108,791	136,023	163,254	190,486	217,718	244,950	272,181	299,413				
	Min	36,984	46,242	55,499	64,757	74,014	83,272	92,529	101,787				
	ETC	91,384	114,259	137,134	160,008	182,883	205,758	228,632	251,507				
SYC3-6.0	BTO	156,659	195,872	235,086	274,300	313,514							
	Min	56,357	70,463	84,570	98,677	112,784							
	ETC	139,252	174,109	208,965	243,822	278,679							
SYC6-4.0	BTO	78,958	98,723	118,487	138,251	158,016	177,780	197,544	217,308	237,073	256,837	276,601	296,366
	Min	26,128	32,668	39,209	45,749	52,289	58,829	65,369	71,910	78,450	84,990	91,530	98,070
	ETC	63,845	79,827	95,808	111,789	127,770	143,752	159,733	175,714	191,696	207,677	223,658	239,639
SYC6-5.0	BTO	123,372	154,254	185,136	216,018	246,899	277,781	308,663	339,544	370,426	401,308	432,190	463,071
	Min	42,411	53,027	63,643	74,259	84,875	95,491	106,107	116,723	127,339	137,955	148,571	159,187
	ETC	103,633	129,573	155,514	181,455	207,395	233,336	259,277	285,217	311,158	337,099	363,039	388,980
SYC6-6.0	BTO	177,656	222,126	266,596	311,065	355,535	400,005	444,474	488,944				
	Min	64,626	80,803	96,980	113,156	129,333	145,510	161,687	177,863				
	ETC	157,917	197,445	236,974	276,502	316,031	355,560	395,088	434,617				
SYC6-7.0	BTO	241,810	302,338	362,866	423,394	483,923							
	Min	87,567	109,486	131,405	153,325	175,244							
	ETC	213,974	267,535	321,095	374,655	428,216							
SYC6-8.0	BTO	315,833	394,891	473,948									
	Min	117,861	147,363	176,865									
	ETC	287,998	360,087	432,176									
SYC14-8.0	BTO	331,492	414,469	497,446	580,422	663,399	746,376	829,353	912,329	995,306			
	Min	127,143	158,969	190,794	222,620	254,445	286,271	318,096	349,922	381,747			
	ETC	302,276	377,940	453,603	529,267	604,931	680,594	756,258	831,922	907,585			
SYC14-10.0	BTO	517,957	647,608	777,259	906,910	1,036,561							
	Min	205,573	257,031	308,489	359,946	411,404							
	ETC	488,741	611,079	733,417	855,755	978,093							
SYC14-12.0	BTO	745,857	932,555										
	Min	294,114	367,735										
	ETC	699,241	874,270										



Scotch Yoke Quarter-Turn Actuators

Dimensional Data

Hydraulic (SY1, SY2, SY3)

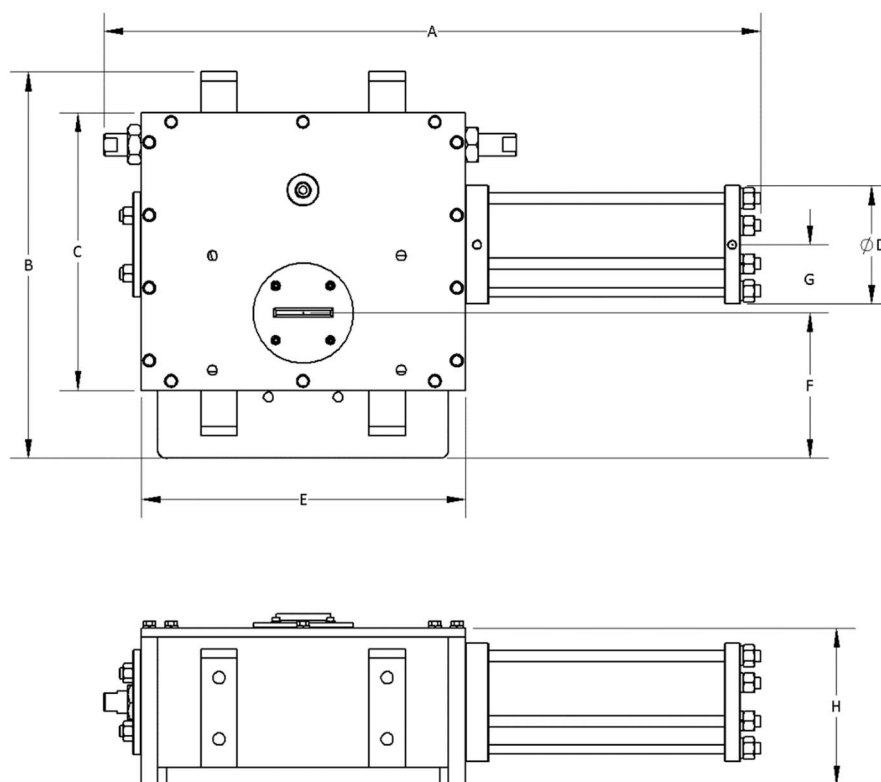


Figure 1. SY1, SY2 & SY3 Hydraulic Dimensional Drawing

Actuator Model	A	B	C	D	E	F	G	H	Port Connection	Weight (lbs)
SY1-3.2	24.5	15.3	11	5.5	11.9	5.5	2.5	6.9	1/4" NPT	171
SY1-4.0	24.5	15.3	11	6.5	11.9	5.5	2.5	6.9	1/4" NPT	200
SY2-3.2	36.1	21.3	15.3	5.5	17.9	8	3.75	8.6	3/8" NPT	348
SY2-4.0	36.1	21.3	15.3	6.5	17.9	8	3.75	8.6	3/8" NPT	359
SY2-5.0	50.4	21.3	15.3	7.5	17.9	8	3.75	8.6	3/8" NPT	385
SY3-4.0	50.7	26	19.75	6.5	24.6	9.125	6.284	8.8	3/8" NPT	586
SY3-5.0	50.7	26	19.75	7.5	24.6	9.125	6.284	8.8	3/8" NPT	625



Scotch Yoke Quarter-Turn Actuators

Dimensional Data

Hydraulic (SY6, SY14)

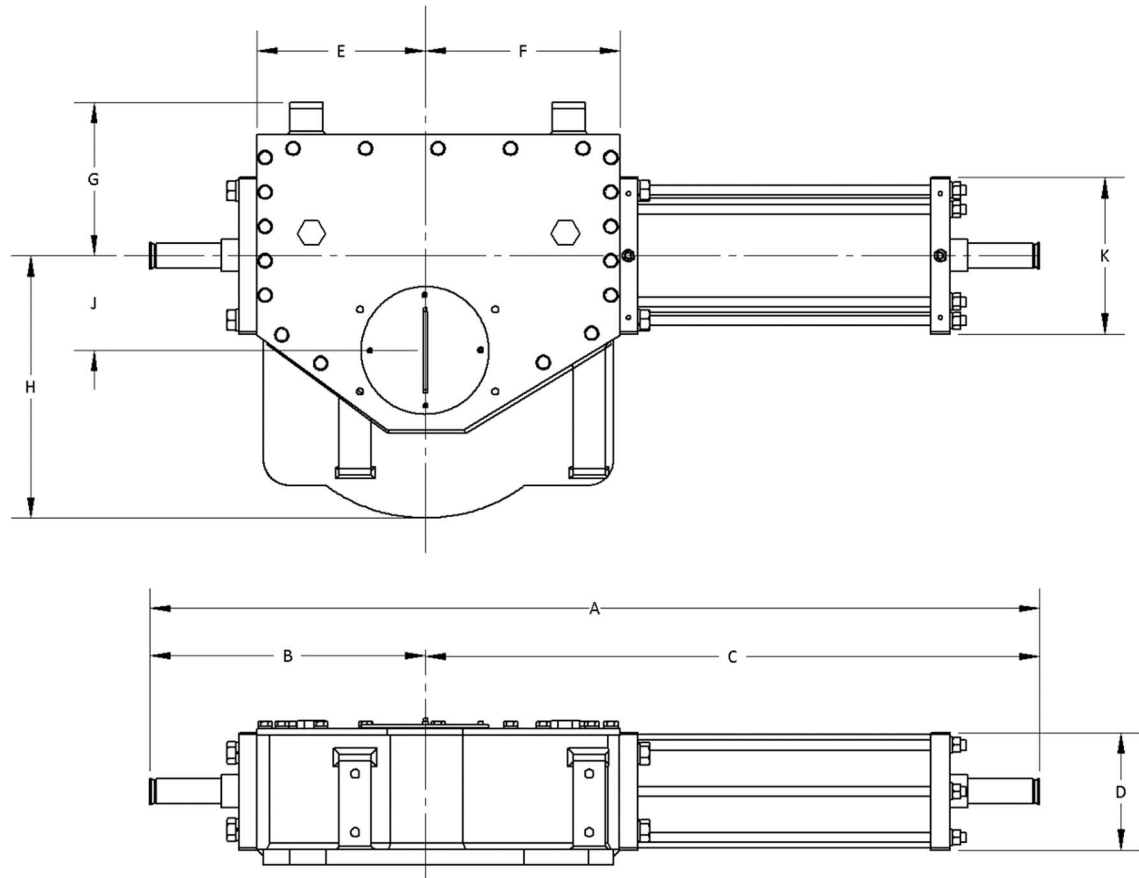


Figure 2. SY6 & SY14 Hydraulic Dimensional Drawing

Actuator Model	A	B	C	D	E	F	G	H	J	K	Port Connection	Weight (lbf)
SY6-5.0	67.1	20	46.8	6.5	12.9	14.4	11.7	10.2	7.28	8.75	1/2" NPT	1020
SY6-6.0	68.3	21.2	47.7	7.5	12.9	14.4	11.7	10.2	7.28	9.25	3/4" NPT	1190
SY6-8.0	68.3	21.2	47.7	9	12.9	14.4	11.7	10.2	7.28	12	3/4" NPT	1280
SY14-8.0	98	48.1	49.9	9	14.8	16.6	13.5	11.6	7.87	12	3/4" NPT	1655
SY14-10.0	98	48.1	49.9	10	14.8	16.6	13.5	11.6	7.87	15	3/4" NPT	1720
SY14-12.0	98	48.1	49.9	12	14.8	16.6	13.5	11.6	7.87	15	3/4" NPT	1810



Scotch Yoke Quarter-Turn Actuators

Dimensional Data

Direct-Gas (SY1, SY2, SY3)

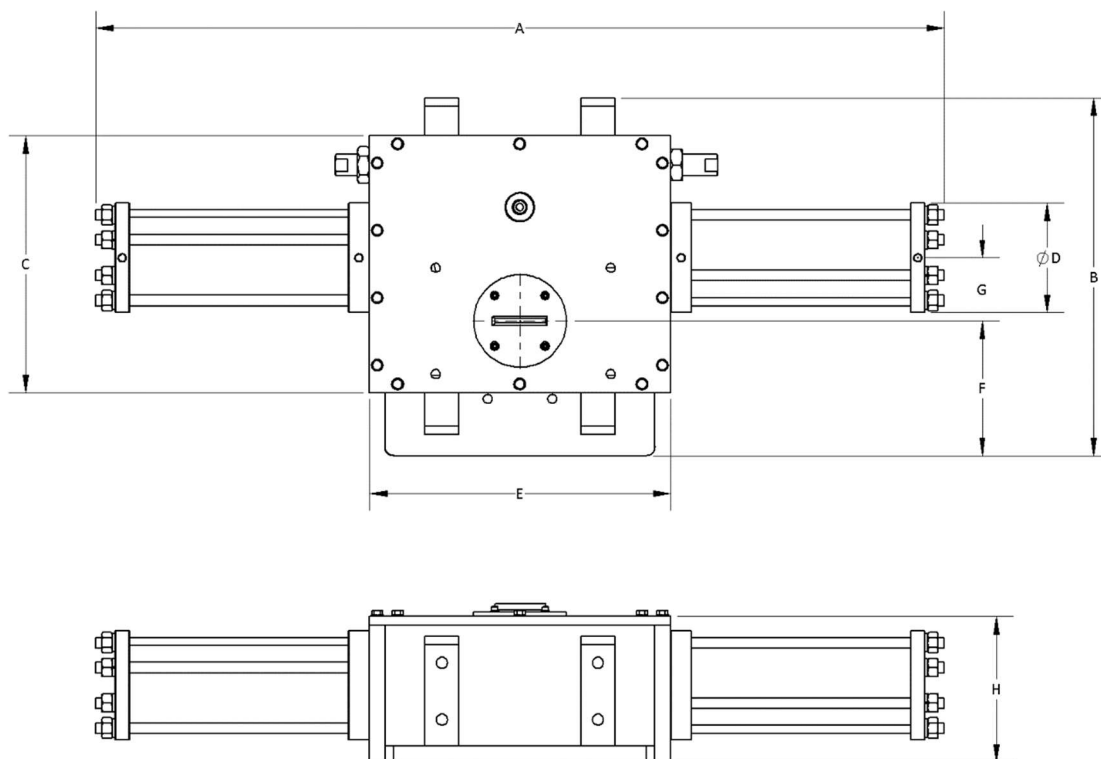


Figure 3. SY1, SY2 & SY3 Direct Gas Dimensional Drawing

Actuator Model	A	B	C	D	E	F	G	H	Port Connection	Weight (lbs)
SY1-3.2	33.9	15.3	11	5.5	11.9	5.5	2.5	6.9	1/4" NPT	201
SY1-4.0	33.9	15.3	11	6.5	11.9	5.5	2.5	6.9	1/4" NPT	224
SY2-3.2	50.4	21.3	15.3	5.5	17.9	8	3.75	8.6	3/8" NPT	398
SY2-4.0	50.4	21.3	15.3	6.5	17.9	8	3.75	8.6	3/8" NPT	419
SY2-5.0	50.4	21.3	15.3	7.5	17.9	8	3.75	8.6	3/8" NPT	445
SY3-4.0	67.8	26	19.75	6.5	24.6	9.125	6.284	8.8	3/8" NPT	674
SY3-5.0	67.8	26	19.75	7.5	24.6	9.125	6.284	8.8	3/8" NPT	705



Scotch Yoke Quarter-Turn Actuators

Dimensional Data

Direct Gas (SY6, SY14)

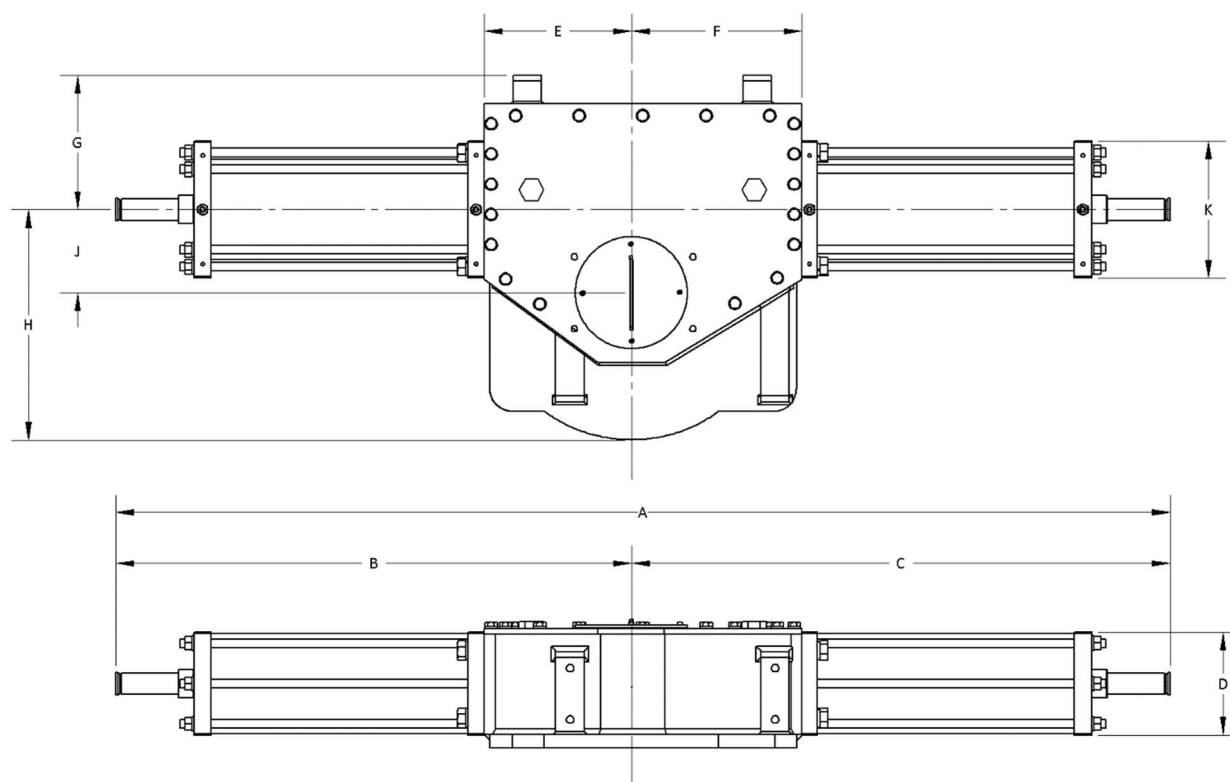


Figure 4. SY6 & SY14 Direct Gas Dimensional Drawing

Actuator Model	A	B	C	D	E	F	G	H	J	K	Port Connection	Weight (lbf)
SY6-5.0	92.1	45.3	46.8	6.5	12.9	14.4	11.7	10.2	7.28	8.75	1/2" NPT	1140
SY6-6.0	93.9	46.2	47.7	7.5	12.9	14.4	11.7	10.2	7.28	9.25	3/4" NPT	1320
SY6-8.0	93.9	46.2	47.7	9	12.9	14.4	11.7	10.2	7.28	12	3/4" NPT	1420
SY14-8.0	98	48.1	49.9	9	14.8	16.6	13.5	11.6	7.87	12	3/4" NPT	1815
SY14-10.0	98	48.1	49.9	10	14.8	16.6	13.5	11.6	7.87	15	3/4" NPT	1930
SY14-12.0	98	48.1	49.9	12	14.8	16.6	13.5	11.6	7.87	15	3/4" NPT	2065



Scotch Yoke Quarter-Turn Actuators

Dimensional Data

Gas Over Oil (SY1, SY2, SY3)

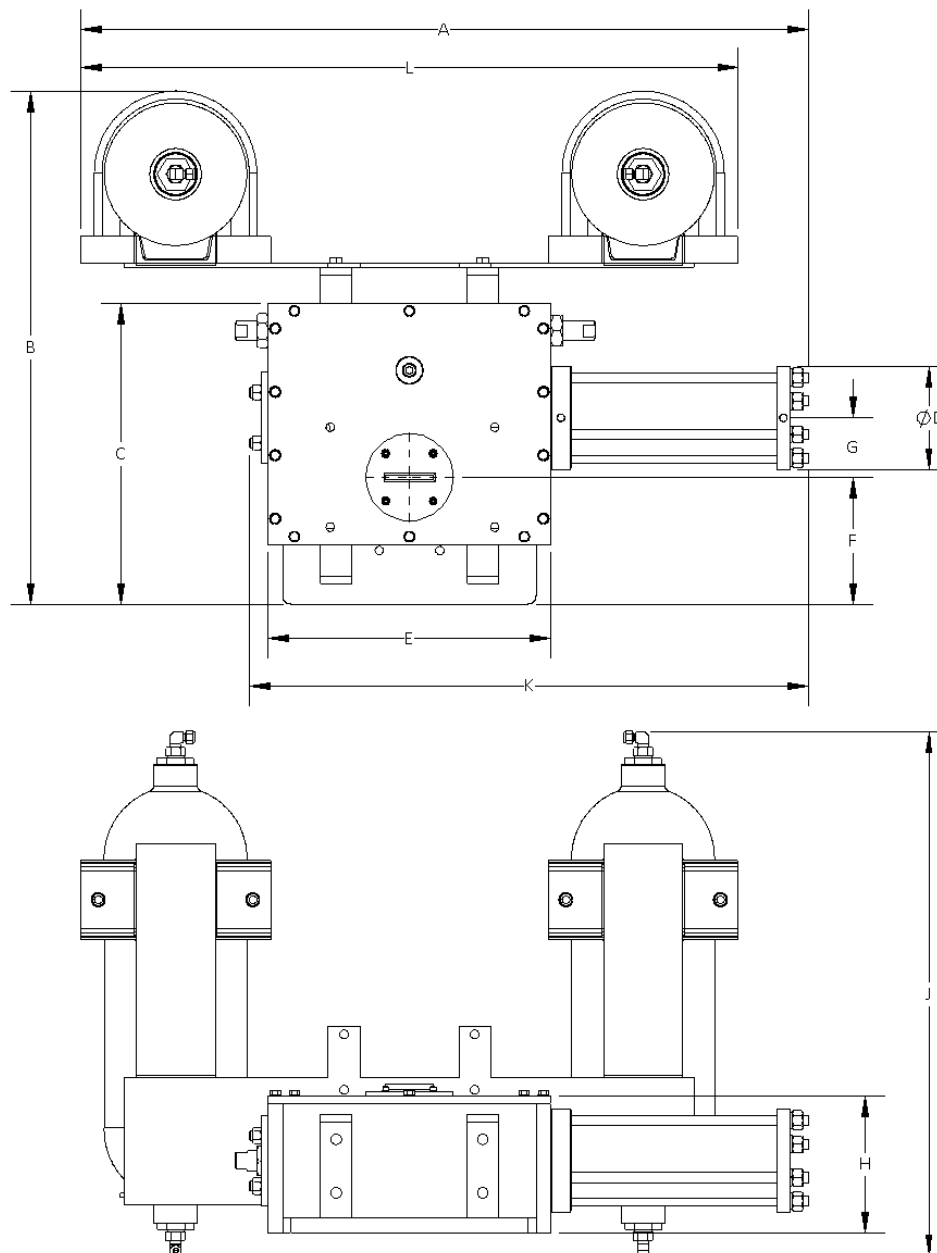


Figure 5. SY1, SY2 and SY3 Gas Over Oil Dimensional Drawing

Actuator Model	A	B	C	D	E	F	G	H	J	K	L	Port Connection	Weight (lbs)
SY1-3.2	32.54	26.1	13.5	5.5	11.9	5.5	2.5	6.9	22.85	24.25	31.5	1/4" NPT	321
SY1-4.0	32.54	26.1	13.5	6.5	11.9	5.5	2.5	6.9	22.85	24.25	31.5	1/4" NPT	424
SY2-3.2	45.9	32.38	19	5.5	17.9	8	3.75	8.6	33.1	35.2	41.5	3/8" NPT	578
SY2-4.0	45.9	32.38	19	6.5	17.9	8	3.75	8.6	33.1	35.2	41.5	3/8" NPT	589
SY2-5.0	45.9	32.38	19	7.5	17.9	8	3.75	8.6	33.1	35.2	41.5	3/8" NPT	625
SY3-4.0	57.4	37.4	23.75	6.5	24.6	9.125	6.284	8.8	55.8	49.7	41.5	3/8" NPT	1024
SY3-5.0	57.4	37.4	23.75	7.5	24.6	9.125	6.284	8.8	55.8	49.7	41.5	3/8" NPT	1055



Scotch Yoke Quarter-Turn Actuators

Dimensional Data

Gas Over Oil (SY6, SY14)

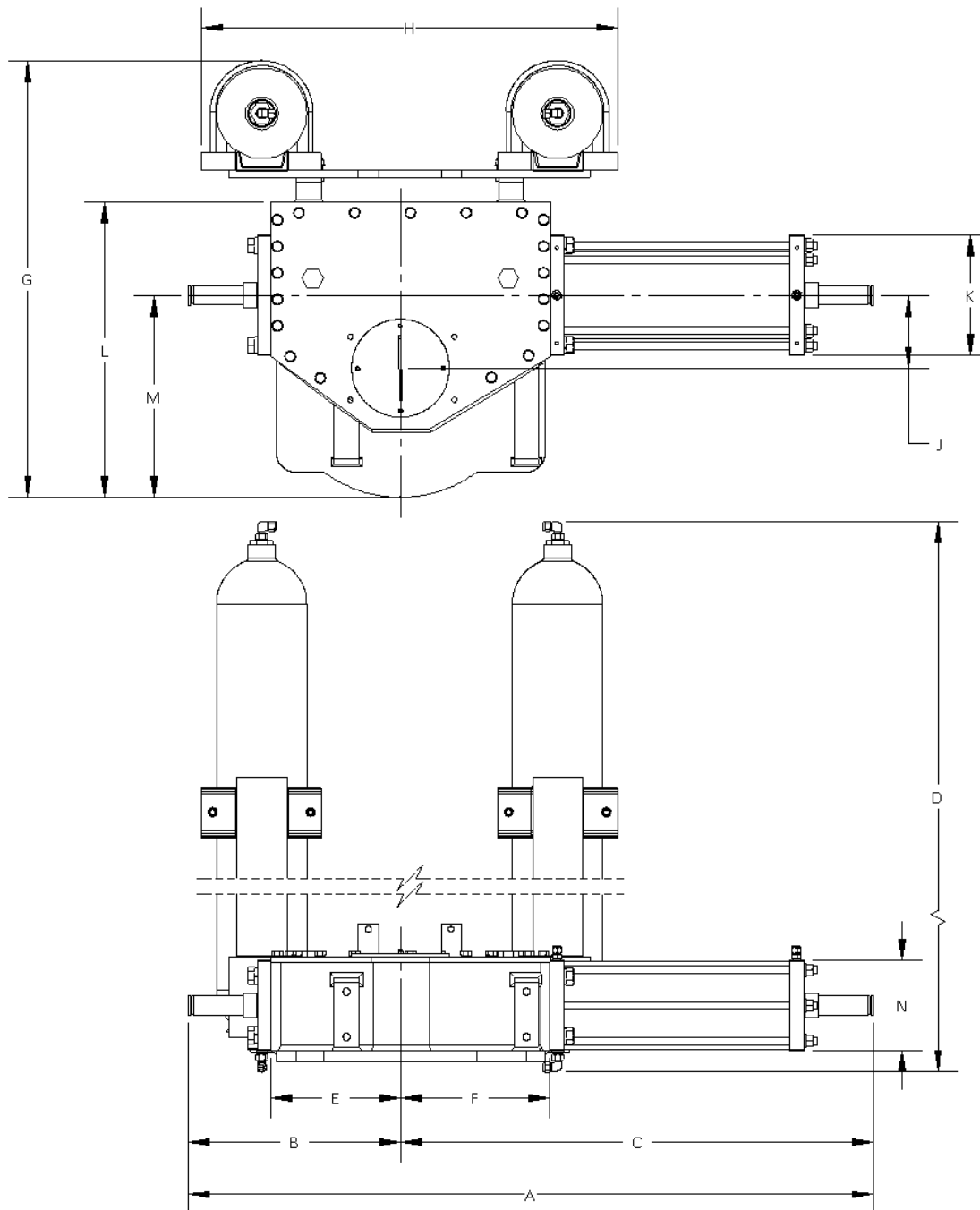


Figure 6. SY6 & SY14 Gas Over Oil Dimensional Drawing

Actuator Model	A	B	C	D	E	F	G	H	J	K	L	M	N	Port Connection	Weight (lbf)
SY6-5.0	67.1	20	46.8	62.3	12.9	14.4	43.5	41.5	7.28	8.75	29.4	20.4	6.5	1/2" NPT	1350
SY6-6.0	68.3	21.2	47.7	62.3	12.9	14.4	43.5	41.5	7.28	9.25	29.4	20.4	7.5	3/4" NPT	1565
SY6-8.0	68.3	21.2	47.7	79.5	12.9	14.4	43.5	41.5	7.28	12	29.4	20.4	9	3/4" NPT	1680
SY14-8.0	98	48.1	49.9	80.4	14.8	16.6	45.75	41.5	7.87	14	31.5	20.75	13	3/4" NPT	1855
SY14-10.0	98	48.1	49.9	80.4	14.8	16.6	45.75	41.5	7.87	14	31.5	20.75	13	3/4" NPT	1920
SY14-12.0	98	48.1	49.9	80.4	14.8	16.6	45.75	41.5	7.87	14	31.5	20.75	13	3/4" NPT	2010



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