

Biffi GPO

Gas Powered Actuator Scotch Yoke Design

Double-acting gas-over-oil actuators for remote and local operation of valves in on/off and modulating heavy-duty service. Available with output torques up to 750000 Nm.



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General Application

GPO gas-over-oil actuators offer the major benefit of using the gas flowing in the pipeline for their operation, with no need for any other power source. They are ideal for pipeline applications in the most extreme environments.

Technical Data

Design pressure: From 7 to 105 barg
(contact factory for PED limit)

Supply medium: Sweet or sour high-pressure gas, nitrogen or instrument air

Output torque: Up to 750000 Nm

Ambient temperature

Standard range: -20 to +100 °C / -4 to +210 °F

Extreme range: -60 to +135 °C / -70 to +275 °F

MAWP: Maximum Allowable Working Pressure is the pressure defined for the design of the actuator pressure containing parts.

MOP: Maximum Operating Pressure is pressure that generates the torque used to engineer the mechanical loaded parts of the actuator and it is the one required to produce the design torque of the actuator.

Features

- Canted or symmetric scotch yoke design achieves high break torques for operating all kinds of quarter-turn valves.
- Control system components engineered specifically to suit remote gas pipeline applications.
- Control components are sealed within a dedicated enclosure, ensuring low maintenance.
- Electronic control groups available to enable full valve network communication.
- Electroless nickel plated and polished cylinder provides maximum corrosion resistance and reduces friction.
- Integral manual hand pump enables valve cycling when sufficient line pressure is not available.
- Totally enclosed weatherproof carbon steel housing for maximum strength.
- Environmentally friendly design ensures up to 50% less gas discharge than alternative systems.
- Gas over oil tanks separate the feeding gas from the hydraulic cylinder.

Approvals

Safety integrity level: (IEC 61508-1 ÷ 7:2010):	Suitable for use in SIL 3 applications
Area classification: (ATEX):	II 2GD
Enclosure standards: (IEC 60529):	IP66, IP66M, IP67M
(ANSI/NEMA 250):	NEMA 4, 4X, 6
Pressure equipment directive:	PED 2014/68/EU
Machinery directive:	2006/42/EC

Figure 1. Gas Over Oil (GPO) Actuator

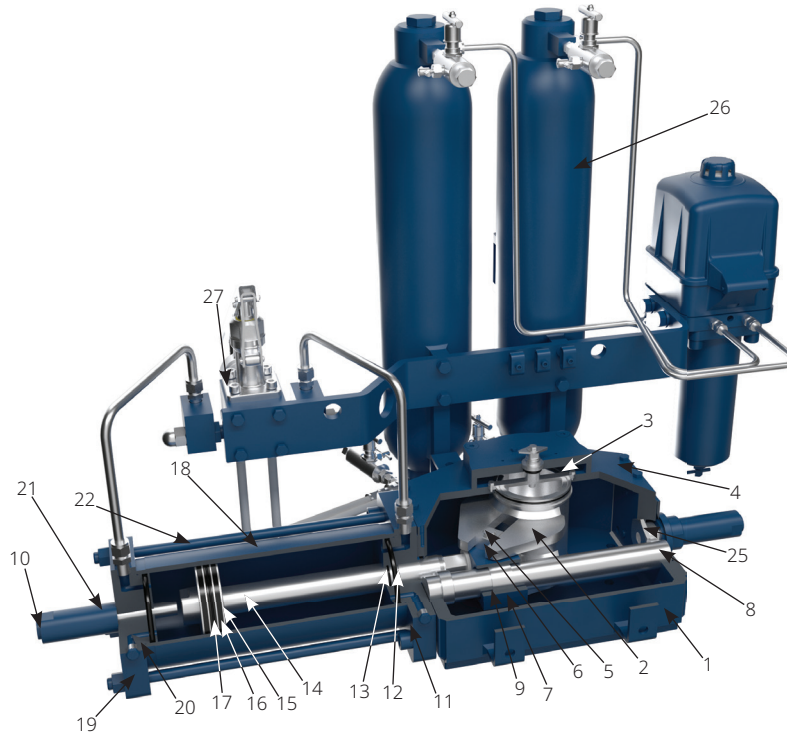


Table 1. Materials

Item	Part	Material
1	Housing	Carbon steel
2	Yoke	Carbon steel
3	Yoke bushing	Bronze
4	Cover	Carbon steel
5	Guide block pin	Alloy steel
6	Sliding block	Bronze
7	Guide block	Carbon steel
8	Guide bar	Alloy steel (hard chrome plated)
9	Guide block bushing	Steel + Bronze + Polytetrafluoroethylene (PTFE)
10	Travel stop screw	Carbon steel
11	Cylinder head flange	Carbon steel
12	Piston rod bushing	Steel + Bronze + PTFE
13	Piston rod seal	Nitrile Butadiene Rubber (NBR)
14	Piston rod	Alloy steel (hard chrome plated)
15	Piston	Carbon steel
16	Piston guide sliding ring	PTFE + Graphite
17	Piston seal O-ring	PTFE + NBR
18	Cylinder tube	Carbon steel (ENP)
19	Cylinder end flange	Carbon steel
20	Cylinder seal O-ring	NBR
21	Sealing washer	Polyvinyl Chloride (PVC)
22	Tie rod	Alloy steel
23	Guide rod	Alloy steel (hard chrome plated)
24	Guide rod bushing	Steel + Bronze + PTFE
25	Travel stop screw	Carbon steel
26	Gas over oil tanks	Carbon steel
27	Hydraulic manual override MHP	Carbon steel

Output Torques

Canted Yoke Design

Table 2. Models 0.3C-45 to 6C2-200

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			15		20		25		30		35		40	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
0.3C-45	100	0°	339	298	458	404	576	510	695	615	814	721	933	827
		45°	132	105	179	142	225	179	271	217	318	254	364	291
		90°	191	145	258	197	325	249	392	300	459	352	525	403
0.3C-75	46	0°	959	943	1289	1268	1619	1593	1948	1918	2278	2244	2608	2569
		45°	375	332	504	447	632	561	761	676	890	791	1019	905
		90°	540	460	726	619	912	778	1098	936	1284	1095	1470	1254
0.3C-100	25	0°	1717	1730	2304	2322	2890	2914	-	-	-	-	-	-
		45°	671	610	900	818	1129	1027	-	-	-	-	-	-
		90°	968	844	1298	1134	1629	1423	-	-	-	-	-	-
0.9C-100	66	0°	1986	2001	2664	2685	3342	3370	4019	4055	4697	4739	5375	5424
		45°	776	705	1041	946	1306	1187	1571	1429	1836	1670	2101	1911
		90°	1119	977	1501	1311	1883	1645	2265	1979	2647	2314	3029	2648
0.9C-135	36	0°	3644	3683	4880	4934	6115	6185	7351	7435	8586	8686	-	-
		45°	1424	1298	1907	1739	2390	2180	2873	2620	3356	3061	-	-
		90°	2054	1798	2750	2409	3446	3019	4143	3630	4839	4241	-	-
1.5C-135	47	0°	4608	4658	6171	6239	7733	7821	9295	9402	10857	10984	12420	12566
		45°	1801	1641	2412	2199	3022	2756	3633	3314	4244	3871	4854	4429
		90°	2597	2274	3478	3046	4358	3818	5239	4590	6119	5363	7000	6135
1.5C-175	28	0°	7770	7910	10396	10586	13021	13261	-	-	-	-	-	-
		45°	3037	2788	4063	3731	5089	4674	-	-	-	-	-	-
		90°	4379	3862	5859	5168	7339	6474	-	-	-	-	-	-
3C-135	57	0°	7628	7710	10214	10327	12800	12945	15385	15563	17971	18181	20557	20799
		45°	2981	2717	3992	3640	5003	4562	6014	5485	7025	6408	8035	7331
		90°	4299	3764	5757	5042	7214	6320	8672	7598	10129	8876	11587	10155
3C-175	34	0°	12861	13093	17207	17521	21552	21950	25897	26379	-	-	-	-
		45°	5027	4614	6726	6175	8424	7736	10123	9297	-	-	-	-
		90°	7249	6392	9698	8554	12147	10717	14596	12879	-	-	-	-
6C-175	58	0°	15036	15307	20116	20484	25196	25662	30277	30839	35357	36017	40437	41194
		45°	5877	5395	7863	7220	9849	9045	11834	10870	13820	12694	15806	14519
		90°	8475	7473	11338	10001	14201	12529	17065	15057	19928	17585	22791	20113
6C-200	44	0°	19693	19867	26328	26568	32963	33268	39598	39969	46233	46670	52868	53371
		45°	7697	7002	10291	9364	12885	11726	15478	14088	18072	16449	20665	18811
		90°	11099	9699	14839	12971	18579	16243	22319	19514	26059	22786	29798	26058
6C2-175	27	0°	28829	31995	38575	42810	48320	53625	-	-	-	-	-	-
		45°	11269	11277	15078	15089	18888	18901	-	-	-	-	-	-
		90°	16249	15621	21742	20901	27235	26182	-	-	-	-	-	-
6C2-200	21	0°	37594	41722	50267	55786	-	-	-	-	-	-	-	-
		45°	14695	14705	19649	19663	-	-	-	-	-	-	-	-
		90°	21189	20370	28332	27237	-	-	-	-	-	-	-	-

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 3. Models 0.3C-45 to 6C2-200 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			45		50		55		60		65		70	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
0.3C-45	100	0°	1051	933	1170	1038	1289	1144	1408	1250	1526	1356	1645	1461
		45°	411	328	457	366	503	403	550	440	596	477	643	515
		90°	592	455	659	507	726	558	793	610	860	662	927	713
0.3C-75	46	0°	2938	2894	-	-	-	-	-	-	-	-	-	-
		45°	1148	1020	-	-	-	-	-	-	-	-	-	-
		90°	1656	1413	-	-	-	-	-	-	-	-	-	-
0.3C-100	25	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
0.9C-100	66	0°	6053	6108	6731	6793	7409	7478	8087	8162	8765	8847	-	-
		45°	2366	2153	2631	2394	2896	2635	3161	2877	3426	3118	-	-
		90°	3412	2982	3794	3316	4176	3651	4558	3985	4940	4319	-	-
0.9C-135	36	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
1.5C-135	47	0°	13982	14147	-	-	-	-	-	-	-	-	-	-
		45°	5465	4986	-	-	-	-	-	-	-	-	-	-
		90°	7881	6907	-	-	-	-	-	-	-	-	-	-
1.5C-175	28	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
3C-135	57	0°	23143	23417	25729	26034	28315	28652	-	-	-	-	-	-
		45°	9046	8253	10057	9176	11068	10099	-	-	-	-	-	-
		90°	13044	11433	14502	12711	15959	13989	-	-	-	-	-	-
3C-175	34	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6C-175	58	0°	45517	46372	50597	51550	55677	56727	-	-	-	-	-	-
		45°	17792	16344	19777	18169	21763	19994	-	-	-	-	-	-
		90°	25655	22640	28518	25168	31381	27696	-	-	-	-	-	-
6C-200	44	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6C2-175	27	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6C2-200	21	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 4. Models 0.3C-45 to 6C2-200 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			75		80		85		90		95		100	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
0.3C-45	100	0°	1764	1567	1882	1673	2001	1778	2120	1884	2239	1990	2357	2096
		45°	689	552	736	589	782	627	828	664	875	701	921	738
		90°	994	765	1061	816	1128	868	1195	920	1262	971	1328	1023
0.3C-75	46	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
0.3C-100	25	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
0.9C-100	66	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
0.9C-135	36	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
1.5C-135	47	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
1.5C-175	28	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
3C-135	57	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
3C-175	34	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6C-175	58	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6C-200	44	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6C2-175	27	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6C2-200	21	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 5. Models 14C-200 to 18C2-350

			Operating Supply Pressure (barg)											
			15		20		25		30		35		40	
Model	MOP* (barg)	Position	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
14C-200	82	0°	21523	21713	28775	29037	36027	36361	43279	43685	50531	51009	57783	58333
		45°	8413	7653	11248	10234	14082	12816	16917	15397	19752	17979	22587	20560
		90°	12131	10601	16219	14177	20306	17753	24394	21329	28481	24904	32568	28480
14C-235	57	0°	29776	30872	39788	41259	49800	51646	59813	62034	69825	72421	79837	82808
		45°	11639	10881	15552	14542	19466	18203	23380	21865	27294	25526	31207	29187
		90°	16783	15073	22426	20144	28069	25216	33712	30287	39356	35359	44999	40430
14C-280	40	0°	42271	43955	56485	58743	70699	73532	84913	88320	99127	103109	113341	117897
		45°	16523	15492	22079	20705	27635	25917	33191	31130	38747	36342	44303	41555
		90°	23826	21460	31837	28681	39848	35901	47860	43121	55871	50342	63883	57562
14C-300	35	0°	48526	50896	64843	68019	81160	85141	97477	102264	113794	119386	-	-
		45°	18968	17939	25346	23974	31724	30009	38102	36044	44481	42079	-	-
		90°	27351	24849	36548	33209	45744	41569	54941	49929	64138	58289	-	-
14C2-235	28	0°	57594	63918	76966	85416	96338	106915	-	-	-	-	-	-
		45°	22513	22529	30085	30106	37657	37684	-	-	-	-	-	-
		90°	32462	31207	43381	41704	54299	52200	-	-	-	-	-	-
14C2-280	19	0°	81878	90868	-	-	-	-	-	-	-	-	-	-
		45°	32005	32028	-	-	-	-	-	-	-	-	-	-
		90°	46149	44365	-	-	-	-	-	-	-	-	-	-
14C2-300	17	0°	94387	104750	-	-	-	-	-	-	-	-	-	-
		45°	36895	36921	-	-	-	-	-	-	-	-	-	-
		90°	53200	51143	-	-	-	-	-	-	-	-	-	-
14C2-350	12	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C-235	75	0°	34242	35503	45756	47448	57271	59393	68785	71339	80299	83284	91813	95229
		45°	13385	12513	17885	16724	22386	20934	26887	25144	31388	29355	35888	33565
		90°	19300	17334	25790	23166	32280	28998	38769	34830	45259	40662	51749	46495
18C-280	53	0°	48612	50548	64958	67555	81304	84562	97650	101569	113996	118575	130342	135582
		45°	19002	17816	25391	23811	31781	29805	38170	35799	44560	41794	50949	47788
		90°	27399	24679	36613	32983	45826	41286	55039	49590	64252	57893	73465	66197
18C-300	45	0°	55805	58531	74569	78221	93334	97912	112098	117603	130863	137294	149627	156985
		45°	21813	20630	29148	27570	36483	34511	43818	41451	51153	48391	58488	55332
		90°	31454	28577	42030	38191	52606	47805	63183	57418	73759	67032	84335	76646
18C2-235	36	0°	66233	73505	88511	98229	110789	122952	133066	147676	155344	172399	-	-
		45°	25890	25908	34598	34622	43306	43336	52014	52051	60722	60765	-	-
		90°	37331	35888	49888	47959	62444	60030	75001	72101	87557	84172	-	-
18C2-280	25	0°	94160	104498	125830	139646	157501	174793	-	-	-	-	-	-
		45°	36806	36832	49186	49220	61565	61609	-	-	-	-	-	-
		90°	53072	51020	70922	68181	88773	85341	-	-	-	-	-	-
18C2-300	22	0°	108546	120463	145053	160979	-	-	-	-	-	-	-	-
		45°	42429	42459	56699	56740	-	-	-	-	-	-	-	-
		90°	61180	58815	81757	78596	-	-	-	-	-	-	-	-
18C2-350	16	0°	148850	165192	-	-	-	-	-	-	-	-	-	-
		45°	58184	58225	-	-	-	-	-	-	-	-	-	-
		90°	83897	80653	-	-	-	-	-	-	-	-	-	-

NOTE:
* MOP = Maximum Operating Pressure (barg)

Table 6. Models 14C-200 to 18C2-350 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			45		50		55		60		65		70	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
14C-200	82	0°	65035	65656	72287	72980	79539	80304	86791	87628	94043	94952	101295	102276
		45°	25421	23141	28256	25723	31091	28304	33925	30886	36760	33467	39595	36049
		90°	36656	32056	40743	35632	44831	39208	48918	42783	53006	46359	57093	49935
14C-235	57	0°	89849	93195	99862	103582	109874	113969	-	-	-	-	-	-
		45°	35121	32848	39035	36509	42948	40170	-	-	-	-	-	-
		90°	50642	45501	56285	50573	61929	55644	-	-	-	-	-	-
14C-280	40	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C-300	35	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C2-235	28	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C2-280	19	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C2-300	17	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C2-350	12	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C-235	75	0°	103327	107174	114841	119120	126355	131065	137869	143010	149383	154955	160897	166901
		45°	40389	37775	44890	41986	49391	46196	53891	50406	58392	54617	62893	58827
		90°	58239	52327	64728	58159	71218	63991	77708	69823	84198	75655	90687	81488
18C-280	53	0°	146688	152589	163034	169596	-	-	-	-	-	-	-	-
		45°	57339	53782	63728	59777	-	-	-	-	-	-	-	-
		90°	82678	74500	91892	82803	-	-	-	-	-	-	-	-
18C-300	45	0°	168392	176676	-	-	-	-	-	-	-	-	-	-
		45°	65822	62272	-	-	-	-	-	-	-	-	-	-
		90°	94912	86260	-	-	-	-	-	-	-	-	-	-
18C2-235	36	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C2-280	25	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C2-300	22	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C2-350	16	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 7. Models 14C-200 to 18C2-350 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			75		80		85		90		95		100	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
14C-200	82	0°	108547	109599	115799	116923	-	-	-	-	-	-	-	-
		45°	42430	38630	45264	41211	-	-	-	-	-	-	-	-
		90°	61181	53511	65268	57087	-	-	-	-	-	-	-	-
14C-235	57	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C-280	40	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C-300	35	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C2-235	28	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C2-280	19	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C2-300	17	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14C2-350	12	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C-235	75	0°	172411	178846	-	-	-	-	-	-	-	-	-	-
		45°	67394	63037	-	-	-	-	-	-	-	-	-	-
		90°	97177	87320	-	-	-	-	-	-	-	-	-	-
18C-280	53	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C-300	45	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C2-235	36	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C2-280	25	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C2-300	22	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18C2-350	16	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-

NOTE:
* MOP = Maximum Operating Pressure (barg)

Table 8. Models 32C-235 to 80C2-300

			Operating Supply Pressure (barg)											
			15		20		25		30		35		40	
Model	MOP* (barg)	Position	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
32C-235	100	0°	40198	41678	53714	55700	67231	69723	80747	83746	94264	97768	107780	111791
		45°	15713	14690	20996	19632	26280	24575	31563	29517	36846	34460	42130	39402
		90°	22657	20348	30275	27195	37893	34041	45512	40888	53130	47734	60749	54581
32C-280	75	0°	57067	59339	76255	79304	95444	99268	114633	119233	133821	139197	153010	159162
		45°	22307	20915	29807	27952	37308	34989	44809	42025	52309	49062	59810	56099
		90°	32165	28972	42980	38719	53796	48467	64611	58214	75426	67962	86242	77709
32C-300	65	0°	65510	68710	87538	91825	109566	114941	131594	138056	153622	161171	175649	184287
		45°	25607	24218	34218	32365	42828	40513	51438	48660	60049	56807	68659	64955
		90°	36924	33547	49339	44833	61755	56119	74171	67404	86587	78690	99002	89976
32C2-235	55	0°	77752	86289	103904	115312	130056	144336	156208	173359	182360	202382	208512	231405
		45°	30392	30414	40615	40644	50837	50873	61060	61103	71283	71333	81505	81563
		90°	43824	42130	58564	56300	73304	70470	88045	84641	102785	98811	117525	112981
32C2-280	38	0°	110536	122672	147714	163932	184892	205192	222070	246452	259248	287712	-	-
		45°	43207	43238	57740	57780	72272	72323	86805	86866	101337	101409	-	-
		90°	62302	59893	83257	80038	104212	100183	125167	120328	146122	140473	-	-
32C2-300	33	0°	127423	141413	170280	188975	213136	236537	255992	284098	-	-	-	-
		45°	49808	49843	66560	66607	83312	83371	100065	100135	-	-	-	-
		90°	71820	69044	95976	92265	120131	115487	144286	138708	-	-	-	-
32C2-350	24	0°	174736	193921	233502	259139	-	-	-	-	-	-	-	-
		45°	68303	68351	91273	91338	-	-	-	-	-	-	-	-
		90°	98488	94680	131610	126522	-	-	-	-	-	-	-	-
50C-235	100	0°	44664	46308	59682	61889	74701	77470	89719	93051	104738	108631	119756	124212
		45°	17458	16322	23329	21814	29200	27305	35070	32797	40941	38289	46811	43781
		90°	25174	22609	33639	30217	42104	37824	50569	45431	59034	53038	67499	60645
50C-280	100	0°	63407	65933	84728	88115	106049	110298	127370	132481	148691	154664	170011	176846
		45°	24785	23239	33119	31058	41453	38876	49787	46695	58121	54514	66455	62332
		90°	35739	32191	47756	43021	59773	53852	71790	64682	83807	75513	95824	86344
50C-300	84	0°	72789	76344	97265	102028	121740	127712	146215	153396	170691	179079	195166	204763
		45°	28452	26909	38020	35961	47587	45014	57154	54067	66721	63119	76288	72172
		90°	41026	37274	54822	49814	68617	62354	82412	74894	96207	87434	110003	99974
50C2-235	69	0°	86392	95877	115449	128125	144507	160373	173565	192621	202622	224869	231680	257117
		45°	33769	33793	45128	45160	56486	56526	67845	67892	79203	79259	90561	90625
		90°	48693	46811	65071	62556	81449	78300	97827	94045	114205	109790	130583	125535
50C2-280	49	0°	122818	136302	164127	182147	205436	227991	246745	273835	288054	319680	329363	365524
		45°	48008	48042	64155	64201	80303	80359	96450	96518	112597	112677	128744	128835
		90°	69224	66548	92508	88931	115791	111314	139074	133698	162358	156081	185641	178464
50C2-300	42	0°	141581	157126	189200	209972	236818	262819	284436	315665	332054	368511	379672	421357
		45°	55342	55382	73956	74008	92569	92635	111183	111262	129796	129888	148410	148515
		90°	79800	76715	106640	102517	133479	128319	160318	154120	187158	179922	213997	205724
50C2-350	31	0°	194152	215468	259447	287932	324741	360396	390036	432859	-	-	-	-
		45°	75892	75945	101415	101487	126938	127028	152461	152569	-	-	-	-
		90°	109431	105200	146233	140580	183036	175960	219839	211340	-	-	-	-
80C2-300	61	0°	163751	181729	218829	242855	273908	303981	328987	365107	384065	426233	439144	487358
		45°	64008	64053	85538	85598	107068	107143	128597	128688	150127	150233	171657	171778
		90°	92296	88727	123340	118572	154384	148416	185429	178260	216473	208104	247517	237948

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 9. Models 32C-235 to 80C2-300 (Continuation)

			Operating Supply Pressure (barg)											
			45		50		55		60		65		70	
Model	MOP* (barg)	Position	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
32C-235	100	0°	121297	125814	134813	139836	148330	153859	161846	167882	175363	181904	188879	195927
		45°	47413	44345	52697	49288	57980	54230	63264	59173	68547	64115	73831	69058
		90°	68367	61427	75986	68274	83604	75120	91222	81967	98841	88813	106459	95659
32C-280	75	0°	172199	179126	191387	199091	210576	219055	229765	239020	248954	258984	268142	278949
		45°	67311	63136	74811	70173	82312	77210	89813	84247	97313	91283	104814	98320
		90°	97057	87457	107873	97204	118688	106952	129504	116699	140319	126447	151135	136194
32C-300	65	0°	197677	207402	219705	230517	241733	253633	263761	276748	285789	299863	-	-
		45°	77270	73102	85880	81250	94491	89397	103101	97545	111712	105692	-	-
		90°	111418	101262	123834	112548	136249	123834	148665	135120	161081	146406	-	-
32C2-235	55	0°	234664	260428	260816	289452	-	-	-	-	-	-	-	-
		45°	91728	91792	101950	102022	-	-	-	-	-	-	-	-
		90°	132265	127152	147005	141322	-	-	-	-	-	-	-	-
32C2-280	38	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
32C2-300	33	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
32C2-350	24	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
50C-235	100	0°	134774	139793	149793	155374	164811	170954	179829	186535	194848	202116	209866	217697
		45°	52682	49272	58552	54764	64423	60256	70293	65747	76164	71239	82034	76731
		90°	75964	68252	84428	75860	92893	83467	101358	91074	109823	98681	118288	106288
50C-280	100	0°	191332	199029	212653	221212	233974	243395	255294	265578	276615	287760	297936	309943
		45°	74790	70151	83124	77970	91458	85789	99792	93607	108126	101426	116460	109245
		90°	107842	97174	119859	108005	131876	118835	143893	129666	155910	140496	167927	151327
50C-300	84	0°	219641	230447	244117	256131	268592	281814	293068	307498	317543	333182	342018	358865
		45°	85855	81225	95423	90278	104990	99330	114557	108383	124124	117436	133691	126488
		90°	123798	112513	137593	125053	151388	137593	165184	150133	178979	162673	192774	175213
50C2-235	69	0°	260738	289365	289796	321613	318853	353861	347911	386109	376969	418357	-	-
		45°	101920	101992	113278	113358	124636	124724	135995	136091	147353	147457	-	-
		90°	146961	141280	163339	157024	179717	172769	196095	188514	212473	204259	-	-
50C2-280	49	0°	370672	411369	-	-	-	-	-	-	-	-	-	-
		45°	144892	144994	-	-	-	-	-	-	-	-	-	-
		90°	208924	200847	-	-	-	-	-	-	-	-	-	-
50C2-300	42	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
50C2-350	31	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
80C2-300	61	0°	494222	548484	549301	609610	604380	670736	659458	731862	-	-	-	-
		45°	193187	193323	214716	214868	236246	236413	257776	257958	-	-	-	-
		90°	278562	267793	309606	297637	340651	327481	371695	357325	-	-	-	-

NOTE:
* MOP = Maximum Operating Pressure (barg)

Table 10. Models 32C-235 to 80C2-300 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			75		80		85		90		95		100	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
32C-235	100	0°	202396	209950	215912	223972	229429	237995	242945	252018	256462	266040	269979	280063
		45°	79114	74000	84398	78943	89681	83885	94965	88828	100248	93770	105532	98713
		90°	114078	102506	121696	109352	129314	116199	136933	123045	144551	129892	152170	136738
32C-280	75	0°	287331	298913	-	-	-	-	-	-	-	-	-	-
		45°	112315	105357	-	-	-	-	-	-	-	-	-	-
		90°	161950	145942	-	-	-	-	-	-	-	-	-	-
32C-300	65	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
32C2-235	55	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
32C2-280	38	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
32C2-300	33	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
32C2-350	24	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
50C-235	100	0°	224884	233277	239903	248858	254921	264439	269939	280020	284958	295600	299976	311181
		45°	87905	82223	93775	87714	99646	93206	105516	98698	111387	104189	117258	109681
		90°	126753	113895	135218	121503	143683	129110	152148	136717	160613	144324	169077	151931
50C-280	100	0°	319257	332126	340577	354309	361898	376491	383219	398674	404540	420857	425860	443040
		45°	124794	117063	133128	124882	141462	132701	149796	140520	158130	148338	166465	156157
		90°	179945	162157	191962	172988	203979	183818	215996	194649	228013	205480	240031	216310
50C-300	84	0°	366494	384549	390969	410233	415444	435917	-	-	-	-	-	-
		45°	143259	135541	152826	144594	162393	153646	-	-	-	-	-	-
		90°	206569	187753	220364	200292	234160	212832	-	-	-	-	-	-
50C2-235	69	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
50C2-280	49	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
50C2-300	42	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
50C2-350	31	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
80C2-300	61	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	

NOTE:
* MOP = Maximum Operating Pressure (barg)

Symmetric Yoke Design

Table 11. Models 0.3S-45 to 6S2-200

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			15		20		25		30		35		40	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
0.3S-45	100	0°	213	189	287	256	362	323	436	390	511	457	585	524
		45°	135	107	182	145	229	183	276	221	324	259	371	297
		90°	243	175	328	237	414	300	499	362	584	424	669	486
0.3S-75	63	0°	602	597	809	803	1016	1010	1223	1216	1430	1422	1637	1628
		45°	381	338	513	455	644	572	775	689	906	805	1038	922
		90°	688	554	925	746	1162	937	1399	1128	1635	1320	1872	1511
0.3S-100	40	0°	1078	1097	1446	1472	1814	1847	2182	2222	2550	2598	-	-
		45°	683	621	917	834	1150	1046	1383	1259	1617	1472	-	-
		90°	1233	1018	1653	1366	2074	1714	2495	2062	2916	2411	-	-
0.9S-100	100	0°	1246	1268	1672	1702	2097	2136	2523	2570	2948	3004	3374	3438
		45°	790	718	1060	964	1330	1210	1599	1456	1869	1702	2139	1948
		90°	1425	1177	1912	1579	2399	1982	2885	2385	3372	2788	3858	3190
0.9S-135	57	0°	2287	2335	3063	3127	3838	3920	4613	4713	5389	5506	6164	6299
		45°	1450	1322	1942	1772	2434	2221	2925	2670	3417	3119	3909	3568
		90°	2616	2166	3503	2902	4390	3638	5276	4374	6163	5109	7050	5845
1.5S-135	69	0°	3138	3203	4201	4290	5265	5378	6329	6466	7393	7553	8457	8641
		45°	1835	1667	2458	2234	3080	2800	3702	3366	4325	3932	4947	4499
		90°	3027	2507	4054	3359	5080	4210	6106	5061	7133	5913	8159	6764
1.5S-175	40	0°	5291	5439	7078	7279	8866	9119	10653	10959	12441	12799	14229	14639
		45°	3095	2832	4141	3790	5186	4748	6232	5706	7278	6664	8324	7622
		90°	5104	4258	6829	5698	8554	7139	10278	8579	12003	10019	13728	11460
3S-135	84	0°	5126	5232	6864	7009	8602	8786	10339	10562	12077	12339	13815	14116
		45°	3039	2763	4070	3702	5100	4640	6131	5578	7161	6517	8192	7455
		90°	5088	4214	6813	5645	8538	7076	10263	8507	11988	9938	13713	11369
3S-175	50	0°	8643	8886	11563	11892	14483	14897	17404	17903	20324	20909	23244	23915
		45°	5125	4693	6857	6280	8588	7868	10320	9455	12052	11043	13783	12630
		90°	8580	7157	11478	9578	14377	11999	17276	14420	20174	16841	23073	19262
6S-175	85	0°	10087	10370	13495	13878	16902	17385	20310	20893	23718	24401	27126	27909
		45°	5992	5487	8017	7343	10041	9200	12066	11056	14090	12912	16115	14768
		90°	10051	8384	13447	11220	16843	14057	20239	16893	23634	19729	27030	22565
6S-200	66	0°	13210	13459	17661	17999	22112	22539	26563	27079	31015	31618	35466	36158
		45°	7848	7122	10492	9524	13136	11927	15781	14329	18425	16731	21069	19133
		90°	13164	10882	17599	14553	22034	18223	26470	21894	30905	25564	35340	29235
6S2-175	41	0°	19339	21676	25877	29003	32414	36330	38952	43658	45489	50985	52027	58312
		45°	11489	11470	15373	15347	19257	19225	23141	23102	27024	26979	30908	30857
		90°	19271	17526	25786	23450	32300	29374	38814	35299	45329	41223	51843	47147
6S2-200	31	0°	25219	28266	33721	37794	42222	47323	50724	56852	-	-	-	-
		45°	14982	14957	20033	19999	25083	25041	30134	30084	-	-	-	-
		90°	25130	22854	33602	30558	42073	38262	50545	45966	-	-	-	-

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 12. Models 0.3S-45 to 6S2-200 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			45		50		55		60		65		70	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
0.3S-45	100	0°	660	591	734	658	809	725	883	792	958	859	1032	926
		45°	418	335	465	373	513	411	560	449	607	486	654	524
		90°	755	548	840	611	925	673	1010	735	1095	797	1181	859
0.3S-75	63	0°	1844	1835	2051	2041	2258	2247	2465	2453	-	-	-	-
		45°	1169	1039	1300	1156	1431	1273	1563	1390	-	-	-	-
		90°	2109	1702	2345	1894	2582	2085	2819	2277	-	-	-	-
0.3S-100	40	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
0.9S-100	100	0°	3799	3872	4225	4306	4650	4740	5076	5174	5501	5608	5926	6042
		45°	2409	2193	2679	2439	2949	2685	3218	2931	3488	3177	3758	3423
		90°	4345	3593	4832	3996	5318	4398	5805	4801	6292	5204	6778	5607
0.9S-135	57	0°	6940	7091	7715	7884	-	-	-	-	-	-	-	-
		45°	4400	4017	4892	4467	-	-	-	-	-	-	-	-
		90°	7937	6581	8824	7317	-	-	-	-	-	-	-	-
1.5S-135	69	0°	9520	9728	10584	10816	11648	11904	12712	12991	13775	14079	-	-
		45°	5569	5065	6192	5631	6814	6197	7436	6764	8059	7330	-	-
		90°	9185	7616	10212	8467	11238	9319	12264	10170	13291	11021	-	-
1.5S-175	40	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
3S-135	84	0°	15553	15893	17291	17669	19028	19446	20766	21223	22504	23000	24242	24776
		45°	9222	8393	10253	9332	11283	10270	12314	11209	13344	12147	14375	13085
		90°	15438	12800	17163	14231	18888	15663	20613	17094	22338	18525	24063	19956
3S-175	50	0°	26164	26920	29084	29926	-	-	-	-	-	-	-	-
		45°	15515	14218	17247	15805	-	-	-	-	-	-	-	-
		90°	25972	21682	28870	24103	-	-	-	-	-	-	-	-
6S-175	85	0°	30534	31416	33942	34924	37350	38432	40757	41940	44165	45447	47573	48955
		45°	18139	16624	20164	18480	22189	20337	24213	22193	26238	24049	28262	25905
		90°	30426	25401	33822	28237	37218	31073	40613	33910	44009	36746	47405	39582
6S-200	66	0°	39917	40698	44368	45238	48819	49778	53270	54317	57721	58857	-	-
		45°	23714	21536	26358	23938	29002	26340	31647	28743	34291	31145	-	-
		90°	39776	32906	44211	36576	48646	40247	53082	43917	57517	47588	-	-
6S2-175	41	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6S2-200	31	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 13. Models 0.3S-45 to 6S2-200 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			75		80		85		90		95		100	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
0.3S-45	100	0°	1107	993	1181	1060	1256	1127	1330	1194	1405	1261	1479	1328
		45°	702	562	749	600	796	638	843	676	891	714	938	752
		90°	1266	922	1351	984	1436	1046	1522	1108	1607	1170	1692	1233
0.3S-75	73	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
0.3S-100	40	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
0.9S-100	100	0°	6352	6476	6777	6910	7203	7344	7628	7777	-	-	-	-
		45°	4028	3669	4298	3914	4567	4160	4837	4406	-	-	-	-
		90°	7265	6009	7752	6412	8238	6815	8725	7218	-	-	-	-
0.9S-135	57	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
1.5S-135	69	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
1.5S-175	40	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
3S-135	84	0°	25979	26553	27717	28330	-	-	-	-	-	-	-	-
		45°	15405	14024	16436	14962	-	-	-	-	-	-	-	-
		90°	25788	21387	27513	22818	-	-	-	-	-	-	-	-
3S-175	50	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6S-175	85	0°	50981	52463	54389	55970	57797	59478	-	-	-	-	-	-
		45°	30287	27761	32311	29617	34336	31474	-	-	-	-	-	-
		90°	50801	42418	54197	45254	57593	48090	-	-	-	-	-	-
6S-200	66	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6S2-175	41	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
6S2-200	31	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 14. Models 14S-200 to 18S2-350

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			15		20		25		30		35		40	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
14S-200	100	0°	14655	14931	19593	19968	24531	25004	29469	30040	34407	35077	39345	40113
		45°	8573	7774	11462	10396	14351	13018	17239	15641	20128	18263	23017	20885
		90°	14139	11689	18903	15631	23668	19574	28432	23517	33196	27459	37960	31402
14S-235	84	0°	20274	21229	27092	28372	33909	35515	40727	42658	47544	49801	54362	56944
		45°	11860	11053	15849	14772	19837	18491	23825	22210	27813	25929	31802	29648
		90°	19561	16619	26138	22211	32716	27803	39293	33394	45871	38986	52448	44578
14S-280	59	0°	28783	30226	38461	40396	48139	50565	57818	60735	67496	70904	77174	81074
		45°	16838	15737	22500	21032	28162	26327	33823	31622	39485	36916	45147	42211
		90°	27770	23662	37107	31623	46445	39584	55783	47545	65120	55506	74458	63468
14S-300	51	0°	33042	34999	44152	46774	55262	58548	66373	70323	77483	82097	88593	93872
		45°	19329	18222	25829	24353	32328	30483	38828	36614	45328	42744	51827	48875
		90°	31878	27399	42598	36616	53317	45834	64036	55051	74755	64269	85475	73486
14S2-235	40	0°	39216	43954	52407	58738	65597	73521	78787	88305	91978	103089	105168	117873
		45°	22941	22885	30658	30582	38374	38279	46091	45977	53807	53674	61524	61371
		90°	37836	34409	50562	45982	63288	57555	76014	69129	88740	80702	101466	92276
14S2-280	28	0°	55751	62486	74503	83503	93255	104520	-	-	-	-	-	-
		45°	32615	32534	43584	43476	54554	54419	-	-	-	-	-	-
		90°	53789	48917	71881	65370	89972	81823	-	-	-	-	-	-
14S2-300	24	0°	64269	72033	85885	96260	-	-	-	-	-	-	-	-
		45°	37597	37504	50243	50118	-	-	-	-	-	-	-	-
		90°	62007	56390	82861	75356	-	-	-	-	-	-	-	-
14S2-350	18	0°	88133	98779	-	-	-	-	-	-	-	-	-	-
		45°	51558	51430	-	-	-	-	-	-	-	-	-	-
		90°	85030	77328	-	-	-	-	-	-	-	-	-	-
18S-235	100	0°	23309	24407	31147	32619	38985	40831	46823	49043	54660	57255	62498	65467
		45°	13640	12711	18226	16988	22813	21265	27399	25542	31986	29819	36572	34096
		90°	22503	19119	30069	25551	37636	31984	45202	38416	52769	44849	60335	51282
18S-280	77	0°	33091	34750	44218	46442	55345	58133	66472	69825	77599	81517	88725	93208
		45°	19364	18098	25875	24188	32386	30277	38898	36366	45409	42455	51920	48545
		90°	31946	27221	42688	36379	53430	45537	64172	54696	74913	63854	85655	73012
18S-300	66	0°	37987	40238	50760	53775	63534	67312	76307	80848	89080	94385	101853	107922
		45°	22229	20956	29704	28007	37178	35057	44653	42107	52128	49157	59602	56208
		90°	36673	31519	49004	42123	61335	52727	73666	63330	85998	73934	98329	84538
18S2-235	53	0°	45086	50533	60251	67529	75415	84526	90580	101522	105745	118519	120909	135516
		45°	26383	26318	35257	35170	44131	44023	53005	52875	61879	61727	70753	70579
		90°	43526	39583	58166	52897	72806	66211	87446	79525	102086	92839	116725	106153
18S2-280	37	0°	64096	71839	85654	96002	107213	120165	128771	144327	150330	168490	-	-
		45°	37507	37415	50123	49999	62738	62584	75354	75168	87970	87753	-	-
		90°	61878	56273	82691	75201	103503	94128	124315	113055	145128	131982	-	-
18S2-300	32	0°	73888	82814	98739	110668	123591	138521	148442	166374	-	-	-	-
		45°	43238	43131	57780	57638	72322	72144	86865	86651	-	-	-	-
		90°	71332	64871	95323	86689	119314	108507	143305	130325	-	-	-	-
18S2-350	23	0°	101324	113564	135400	151757	-	-	-	-	-	-	-	-
		45°	59292	59146	79233	79038	-	-	-	-	-	-	-	-
		90°	97818	88958	130715	118875	-	-	-	-	-	-	-	-

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 15. Models 14S-200 to 18S2-350 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			45		50		55		60		65		70	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
14S-200	100	0°	44283	45149	49221	50186	54159	55222	59096	60258	64034	65295	68972	70331
		45°	25905	23507	28794	26129	31683	28752	34571	31374	37460	33996	40349	36618
		90°	42724	35345	47488	39287	52252	43230	57016	47173	61780	51115	66544	55058
14S-235	84	0°	61179	64087	67996	71230	74814	78373	81631	85515	88449	92658	95266	99801
		45°	35790	33367	39778	37086	43766	40805	47754	44524	51743	48243	55731	51962
		90°	59025	50170	65603	55761	72180	61353	78758	66945	85335	72536	91913	78128
14S-280	59	0°	86853	91243	96531	101413	106209	111582	-	-	-	-	-	-
		45°	50809	47506	56471	52801	62133	58096	-	-	-	-	-	-
		90°	83795	71429	93133	79390	102471	87351	-	-	-	-	-	-
14S-300	51	0°	99703	105646	110814	117421	-	-	-	-	-	-	-	-
		45°	58327	55005	64826	61136	-	-	-	-	-	-	-	-
		90°	96194	82704	106913	91922	-	-	-	-	-	-	-	-
14S2-235	40	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14S2-280	28	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14S2-300	24	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14S2-350	18	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18S-235	100	0°	70336	73679	78174	81891	86012	90103	93849	98315	101687	106527	109525	114739
		45°	41159	38373	45745	42650	50332	46927	54918	51204	59505	55481	64091	59758
		90°	67902	57714	75469	64147	83035	70580	90602	77012	98168	83445	105735	89878
18S-280	77	0°	99852	104900	110979	116592	122106	128283	133233	139975	144360	151667	155487	163358
		45°	58431	54634	64943	60723	71454	66812	77965	72902	84476	78991	90987	85080
		90°	96397	82171	107139	91329	117881	100487	128623	109646	139365	118804	150107	127962
18S-300	66	0°	114627	121459	127400	134996	140173	148533	152946	162069	165720	175606	-	-
		45°	67077	63258	74551	70308	82026	77359	89501	84409	96975	91459	-	-
		90°	110660	95142	122991	105745	135323	116349	147654	126953	159985	137557	-	-
18S2-235	53	0°	136074	152512	151239	169509	-	-	-	-	-	-	-	-
		45°	79627	79431	88501	88283	-	-	-	-	-	-	-	-
		90°	131365	119466	146005	132780	-	-	-	-	-	-	-	-
18S2-280	37	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18S2-300	32	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18S2-350	23	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-

NOTE:
* MOP = Maximum Operating Pressure (barg)

Table 16. Models 14S-200 to 18S2-350 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			75		80		85		90		95		100	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
14S-200	100	0°	73910	75367	78848	80404	83786	85440	88724	90476	93662	95513	98600	100549
		45°	43238	39240	46126	41863	49015	44485	51904	47107	54792	49729	57681	52351
		90°	71309	59000	76073	62943	80837	66886	85601	70828	90365	74771	95129	78714
14S-235	84	0°	102083	106944	108901	114087	-	-	-	-	-	-	-	-
		45°	59719	55681	63707	59400	-	-	-	-	-	-	-	-
		90°	98490	83720	105067	89312	-	-	-	-	-	-	-	-
14S-280	59	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14S-300	51	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14S2-235	40	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14S2-280	28	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14S2-300	24	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
14S2-350	18	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18S-235	100	0°	117363	122951	125201	131163	133038	139375	140876	147587	148714	155799	156552	164011
		45°	68678	64035	73265	68312	77851	72589	82438	76866	87024	81143	91611	85420
		90°	113302	96310	120868	102743	128435	109176	136001	115608	143568	122041	151135	128474
18S-280	77	0°	166614	175050	-	-	-	-	-	-	-	-	-	-
		45°	97499	91169	-	-	-	-	-	-	-	-	-	-
		90°	160849	137121	-	-	-	-	-	-	-	-	-	-
18S-300	66	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18S2-235	53	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18S2-280	37	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18S2-300	32	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-
18S2-350	23	0°	-	-	-	-	-	-	-	-	-	-	-	-
		45°	-	-	-	-	-	-	-	-	-	-	-	-
		90°	-	-	-	-	-	-	-	-	-	-	-	-

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 17. Models 32S-235 to 80S2-300

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			15		20		25		30		35		40	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
32S-235	100	0°	27014	28286	36097	37804	45181	47321	54265	56838	63348	66355	72432	75872
		45°	16019	14939	21405	19966	26792	24992	32178	30018	37565	35045	42951	40071
		90°	26815	22783	35832	30448	44849	38114	53866	45779	62882	53445	71899	61110
32S-280	100	0°	38350	40273	51246	53823	64141	67373	77037	80923	89932	94473	102827	108023
		45°	22741	21270	30388	28426	38035	35583	45682	42739	53329	49895	60976	57052
		90°	38069	32438	50869	43351	63670	54265	76470	65178	89271	76092	102072	87005
32S-300	100	0°	44025	46633	58828	62322	73632	78010	88435	93698	103238	109387	118042	125075
		45°	26106	24629	34885	32915	43663	41200	52441	49486	61220	57772	69998	66058
		90°	43701	37560	58396	50196	73090	62832	87785	75468	102479	88104	117174	100740
32S2-235	81	0°	52252	58564	69827	78262	87402	97960	104977	117658	122552	137356	140127	157054
		45°	30985	30930	41407	41334	51829	51737	62250	62141	72672	72544	83094	82947
		90°	51868	47170	69314	63035	86759	78901	104205	94766	121651	110632	139096	126497
32S2-280	57	0°	74283	83257	99268	111260	124253	139263	149238	167267	174223	195270	199208	223273
		45°	44050	43972	58865	58761	73681	73551	88497	88341	103313	103131	118129	117920
		90°	73737	67058	98539	89613	123340	112168	148141	134723	172942	157277	197743	179832
32S2-300	49	0°	85632	95977	114433	128257	143234	160537	172035	192817	200836	225097	229636	257377
		45°	50779	50690	67858	67738	84937	84787	102016	101835	119094	118884	136173	135933
		90°	85003	77303	113592	103303	142181	129302	170770	155302	199359	181301	227948	207301
32S2-350	36	0°	117428	131614	156920	175877	196413	220140	235905	264403	-	-	-	-
		45°	69634	69511	93053	92889	116472	116266	139890	139643	-	-	-	-
		90°	116565	106007	155767	141658	194969	177309	234171	212960	-	-	-	-
50S-235	100	0°	30016	31429	40108	42004	50201	52579	60294	63153	70387	73728	80480	84303
		45°	17799	16599	23784	22184	29769	27769	35754	33354	41739	38939	47724	44524
		90°	29795	25314	39813	33831	49832	42349	59851	50866	69869	59383	79888	67900
50S-280	100	0°	42612	44748	56940	59804	71268	74859	85596	89915	99925	104970	114253	120025
		45°	25268	23633	33765	31585	42261	39536	50758	47488	59255	55439	67751	63391
		90°	42298	36042	56521	48168	70744	60294	84967	72420	99190	84547	113413	96673
50S-300	100	0°	48917	51815	65365	69246	81813	86678	98261	104109	114709	121541	131158	138972
		45°	29007	27366	38761	36572	48514	45778	58268	54985	68022	64191	77776	73398
		90°	48557	41733	64884	55773	81212	69813	97539	83853	113866	97893	130193	111933
50S2-235	100	0°	58058	65071	77585	86958	97113	108845	116641	130731	136169	152618	155696	174505
		45°	34428	34367	46008	45926	57587	57486	69167	69045	80747	80605	92327	92164
		90°	57631	52411	77015	70039	96399	87668	115783	105296	135168	122924	154552	140553
50S2-280	72	0°	82537	92508	110298	123623	138059	154737	165820	185852	193581	216966	221342	248081
		45°	48944	48858	65406	65291	81868	81724	98330	98157	114792	114590	131255	131023
		90°	81931	74509	109487	99570	137044	124631	164601	149692	192158	174753	219715	199813
50S2-300	62	0°	95147	106641	127148	142508	159149	178375	191150	214241	223151	250108	255152	285975
		45°	56421	56322	75398	75265	94374	94208	113351	113151	132327	132093	151303	151036
		90°	94448	85893	126213	114781	157979	143669	189745	172558	221510	201446	253276	230335
50S2-350	45	0°	130476	146238	174356	195419	218236	244600	262117	293781	305997	342962	349877	392143
		45°	77371	77235	103392	103210	129413	129184	155434	155159	181454	181134	207475	207109
		90°	129517	117785	173074	157398	216632	197010	260190	236622	303747	276234	347305	315847
80S2-300	90	0°	110045	123339	147060	164825	184075	206311	221089	247798	258104	289284	295118	330770
		45°	65256	65141	87206	87052	109155	108962	131105	130873	153054	152784	175004	174695
		90°	109236	99342	145979	132756	182721	166171	219464	199585	256206	233000	292949	266414

NOTE:
* MOP = Maximum Operating Pressure (barg)

Table 18. Models 32S-235 to 80S2-300 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			45		50		55		60		65		70	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
32S-235	100	0°	81515	85389	90599	94907	99682	104424	108766	113941	117849	123458	126933	132975
		45°	48338	45098	53724	50124	59111	55151	64497	60177	69884	65204	75270	70230
		90°	80916	68776	89933	76441	98949	84107	107966	91772	116983	99438	126000	107103
32S-280	100	0°	115723	121573	128618	135123	141514	148672	154409	162222	167304	175772	180200	189322
		45°	68623	64208	76270	71364	83917	78521	91564	85677	99211	92833	106857	99990
		90°	114872	97919	127673	108833	140473	119746	153274	130660	166075	141573	178875	152487
32S-300	100	0°	132845	140763	147649	156452	162452	172140	177255	187829	192059	203517	206862	219205
		45°	78776	74343	87555	82629	96333	90915	105111	99201	113890	107486	122668	115772
		90°	131869	113376	146563	126012	161258	138648	175952	151284	190647	163920	205342	176556
32S2-235	81	0°	157701	176752	175276	196450	192851	216148	210426	235846	228001	255545	245576	275243
		45°	93516	93351	103938	103754	114360	114158	124782	124561	135203	134965	145625	145368
		90°	156542	142363	173988	158228	191434	174094	208879	189959	226325	205825	243771	221690
32S2-280	57	0°	224193	251276	249177	279279	284157	318484	-	-	-	-	-	-
		45°	132945	132710	147761	147500	168518	168523	-	-	-	-	-	-
		90°	222544	202387	247346	224941	282068	265519	-	-	-	-	-	-
32S2-300	49	0°	258437	289657	-	-	-	-	-	-	-	-	-	-
		45°	153252	152981	-	-	-	-	-	-	-	-	-	-
		90°	256537	233301	-	-	-	-	-	-	-	-	-	-
32S2-350	36	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
50S-235	100	0°	90572	94877	100665	105452	110758	116026	120851	126601	130944	137176	141036	147750
		45°	53709	50109	59694	55694	65679	61279	71664	66864	77649	72449	83634	78034
		90°	89907	76418	99925	84935	109944	93452	119962	101969	129981	110486	140000	119004
50S-280	100	0°	128581	135081	142909	150136	157237	165192	171566	180247	185894	195303	200222	210358
		45°	76248	71342	84744	79294	93241	87245	101737	95197	110234	103148	118731	111100
		90°	127636	108799	141859	120925	156082	133051	170304	145178	184527	157304	198750	169430
50S-300	100	0°	147606	156404	164054	173835	180502	191267	196950	208698	213399	226130	229847	243562
		45°	87529	82604	97283	91810	107037	101017	116790	110223	126544	119429	136298	128636
		90°	146521	125973	162848	140013	179175	154053	195503	168093	211830	182133	228157	196173
50S2-235	100	0°	175224	196392	194752	218278	214279	240165	233807	262052	253335	283938	272862	305825
		45°	103907	103723	115487	115283	127066	126842	138646	138401	150226	149961	161806	161520
		90°	173936	158181	193320	175809	212704	193438	232088	211066	251472	228694	270857	246323
50S2-280	72	0°	249103	279195	276864	310310	304625	341425	332386	372539	360147	403654	387908	434768
		45°	147717	147456	164179	163889	180641	180322	197103	196755	213565	213188	230027	229621
		90°	247272	224874	274829	249935	302385	274996	329942	300057	357499	325117	385056	350178
50S2-300	62	0°	287153	321842	319153	357708	351154	393575	383155	429442	-	-	-	-
		45°	170280	169979	189256	188922	208233	207865	227209	226808	-	-	-	-
		90°	285042	259223	316807	288111	348573	317000	380339	345888	-	-	-	-
50S2-350	45	0°	393757	441324	-	-	-	-	-	-	-	-	-	-
		45°	233496	233084	-	-	-	-	-	-	-	-	-	-
		90°	390863	355459	-	-	-	-	-	-	-	-	-	-
80S2-300	90	0°	332133	372256	369148	413742	406162	455228	443177	496714	480191	538200	517206	579686
		45°	196953	196605	218902	218516	240852	240427	262801	262337	284751	284248	306700	306159
		90°	329691	299828	366434	333243	403176	366657	439919	400072	476661	433486	513404	466900

NOTE:

* MOP = Maximum Operating Pressure (barg)

Table 19. Models 32S-235 to 80S2-300 (Continuation)

Model	MOP* (barg)	Position	Operating Supply Pressure (barg)											
			75		80		85		90		95		100	
			OP	CL	OP	CL	OP	CL	OP	CL	OP	CL	OP	CL
32S-235	100	0°	136016	142493	145100	152010	154183	161527	163267	171044	172350	180561	181434	190078
		45°	80657	75257	86043	80283	91430	85310	96816	90336	102203	95363	107589	100389
		90°	135016	114769	144033	122434	153050	130100	162067	137765	171083	145431	180100	153096
32S-280	100	0°	193095	202872	205991	216422	218886	229972	231781	243522	244677	257072	257572	270621
		45°	114504	107146	122151	114302	129798	121459	137445	128615	145092	135771	152739	142927
		90°	191676	163400	204476	174314	217277	185228	230078	196141	242878	207055	255679	217968
32S-300	100	0°	221666	234894	236469	250582	251272	266270	266076	281959	280879	297647	-	-
		45°	131446	124058	140225	132344	149003	140630	157781	148915	166560	157201	-	-
		90°	220036	189192	234731	201828	249425	214464	264120	227100	278814	239736	-	-
32S2-235	81	0°	263151	294941	280726	314639	-	-	-	-	-	-	-	-
		45°	156047	155772	166484	166489	-	-	-	-	-	-	-	-
		90°	261217	237556	278663	253422	-	-	-	-	-	-	-	-
32S2-280	57	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
32S2-300	49	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
32S2-350	36	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
50S-235	100	0°	151129	158325	161222	168900	171315	179474	181408	190049	191500	200624	201593	211198
		45°	89619	83619	95604	89204	101589	94789	107574	100373	113559	105958	119544	111543
		90°	150018	127521	160037	136038	170055	144555	180074	153072	190093	161590	200111	170107
50S-280	100	0°	214550	225413	228879	240469	243207	255524	257535	270580	271863	285635	286192	300691
		45°	127227	119051	135724	127002	144220	134954	152717	142905	161213	150857	169710	158808
		90°	212973	181556	227196	193682	241419	205809	255642	217935	269865	230061	284088	242187
50S-300	100	0°	246295	260993	262743	278425	279192	295856	295640	313288	312088	330719	328536	348151
		45°	146052	137842	155805	147049	165559	156255	175313	165461	185066	174668	194820	183874
		90°	244485	210213	260812	224253	277139	238293	293467	252333	309794	266373	326121	280413
50S2-235	100	0°	292390	327712	311918	349599	331445	371485	350973	393372	370501	415259	390029	437145
		45°	173386	173080	184966	184639	196545	196198	208125	207758	219705	219317	231285	230876
		90°	290241	263951	309625	281579	329009	299208	348393	316836	367777	334464	387161	352093
50S2-280	72	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
50S2-300	62	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
50S2-350	45	0°	-	-	-	-	-	-	-	-	-	-	-	
		45°	-	-	-	-	-	-	-	-	-	-	-	
		90°	-	-	-	-	-	-	-	-	-	-	-	
80S2-300	90	0°	554220	621172	591235	662658	628250	704144	665264	745630	-	-	-	-
		45°	328650	328070	350599	349980	372549	371891	394498	393802	-	-	-	-
		90°	550146	500315	586889	533729	623631	567144	660374	600558	-	-	-	-

NOTE:

* MOP = Maximum Operating Pressure (barg)

Overall Dimensions

Single Cylinder

Figure 2. Single Cylinder Assembly Drawing

Notes:

- X = 1/2 in. NPT gas supply connection
- Y = 1/4 in. NPT emergency gas supply connection
- W = 1 in. NPT electric connection
- 25 mm lifting holes diameter

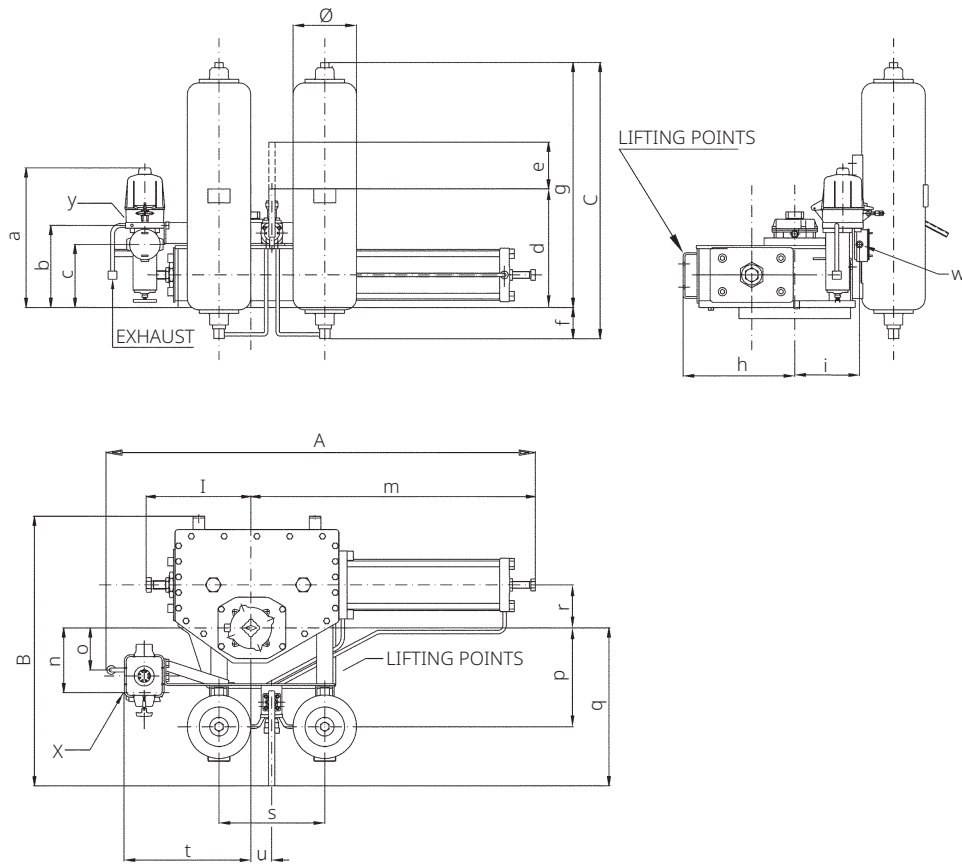


Table 20. Dimensions (mm)

Model	A	B	C	Ø	Specifications					
					Weight (kg)	Gas Consumption (liters)	Oil Displacement (liters)	Tank Capacity (liters)	Oil Content (liters)	MHP Operations Per Stroke (Dual Displacement)
0.3-75	974	645	824	102	130	1.6	0.6	4.3	8.0	25
0.3-100	974	645	824	102	140	2.7	1.1	4.3	7.6	45
0.9-100	1166	708	793	142	195	3.2	1.3	7.5	13.5	51
0.9-135	1110	681	829	142	190	5.2	2.4	7.5	1.0	93
1.5-135	1259	774	793	142	210	6.0	3.0	7.5	12.5	117
1.5-175	1343	774	1121	142	250	9.0	5.0	12.0	20.0	196
3-135	1545	934	1310	168	390	9.0	4.8	19.0	33.0	187
3-175	1653	934	1310	168	410	14.0	8.0	19.0	33.0	314
6-175	1807	1169	1037	219	515	17.0	9.3	24.0	40.0	363
6-200	1893	1169	1037	219	550	20.0	12.1	24.0	40.0	474
14-200	1890	1211	1398	219	890	22	13.1	35.0	60.0	513
14-235	2242	1211	1398	219	950	30	18.1	35.0	60.0	708
14-280	2293	1211	1308	219	1320	42	25.7	56.0	85.0	1005 (315)
14-300	2306	1007	1308	273	1490	48	29.5	56.0	95.0	1154 (362)
18-235	1366	1060	1308	273	1190	34	20.8	35.0	70.0	814 (2559)
18-280	2353	1060	1308	273	1430	48	29.6	56.0	100.0	1156 (362)
18-300	2366	1264	1308	273	1750	55	34.0	75.0	110.0	1327 (416)
32-235	2532	1270	1308	273	1580	40	24.5	56.0	80.0	956 (300)
32-280	2536	1270	1962	273	1820	57	34.7	75.0	115.0	1357 (425)
32-300	2562	1476	1963	273	1910	65	39.9	75.0	130.0	1558 (488)
50-235	2770	1508	1488	273	2020	44	27.2	56.0	90.0	1062 (333)
50-280	2792	1508	1962	273	2210	63	38.6	75.0	130.0	1508 (473)
50-300	2796	1508	1556	355	2400	72	44.3	100.0	150.0	1731 (542)

Table 21. Dimensions (mm)

Model	a	b	c	d	f	g	h	i	l	m	n	o	p	q	r	s	t	u
0.3-75	515	268	186	427	55	756	200	348	397	577	292	221	189	345	70	155	353	300
0.3-100	515	268	186	427	55	768	200	348	397	577	292	221	221	445	70	155	353	300
0.9-100	546	299	216	306	12	785	243	348	516	650	310	250	268	483	63	185	473	377
0.9-135	546	299	216	306	12	817	243	348	245	593	315	244	250	393	80	185	367	377
1.5-135	533	286	203	474	4	789	284	367	225	743	342	282	303	515	80	185	473	377
1.5-175	552	305	223	464	14	1135	284	367	311	827	342	282	285	499	98	185	473	377
3-135	552	305	234	481	32	1278	371	438	409	1057	406	346	405	643	80	235	445	373
3-175	552	305	234	481	13	1296	371	438	409	1165	406	346	387	625	98	235	445	373
6-175	736	488	405	970	67	970	480	154	466	1220	129	69	496	776	98	455	544	90
6-200	736	488	405	652	50	987	480	154	466	1306	129	69	479	759	115	455	544	90
14-200	642	394	311	625	40	1357	543	393	374	1358	368	216	390	668	200	630	839	-
14-235	761	484	401	679	14	1412	543	393	531	1361	368	308	421	699	169	630	839	-
14-280	761	484	401	686	20	1328	543	393	531	1412	368	308	440	688	180	630	839	-
14-300	761	484	401	705	37	1311	543	393	533	1425	368	308	424	672	196	630	829	-
18-235	738	491	408	653	16	1292	600	401	584	1485	364	304	476	724	170	630	838	-
18-280	738	491	408	663	6	1302	600	401	584	1485	364	304	466	714	180	630	838	-
18-300	738	503	411	679	37	1318	600	401	584	1485	364	304	450	698	196	630	829	-
32-235	703	456	373	614	56	1253	660	551	620	1651	514	454	666	914	170	630	838	-
32-280	703	456	373	624	41	1921	660	551	620	1655	514	454	656	904	180	630	838	-
32-300	620	373	290	562	102	1860	709	393	881	1861	514	454	565	816	270	630	838	-
50-235	652	404	321	593	102	1386	709	393	690	636	356	296	552	803	300	860	955	43
50-280	652	404	321	675	102	1860	709	393	999	1793	356	296	552	803	300	860	955	43
50-300	658	410	327	733	96	1459	709	393	999	1797	356	296	596	803	300	860	955	43

Double Cylinder

Figure 3. Double Cylinder Assembly Drawing

Notes:

- X = 1/2 in. NPT gas supply connection
- Y = 1/4 in. NPT emergency gas supply connection
- W = 1 in. NPT electric connection
- 25 mm lifting holes diameter

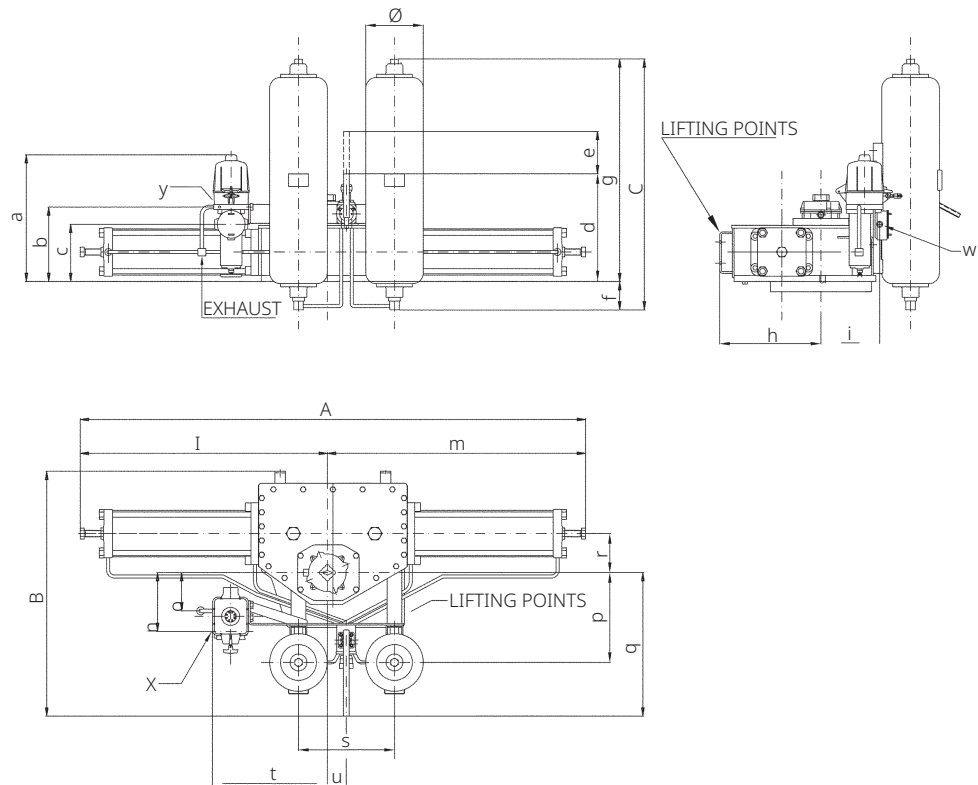


Table 22. Dimensions (mm)

Model	A	B	C	Ø	Specifications					
					Weight (kg)	Gas Consumption (liters)	Oil Displacement (liters)	Tank Capacity (liters)	Oil Content (liters)	MHP Operations Per Stroke (Dual Displacement)
6-2-175	2375	1041	1455	273	713	34	18.6	35	60	363
6-2-200	2559	1074	1227	273	1010	40	24.3	49	80	474
14-2-235	2662	1219	2012	273	1400	59	36.3	75	120	708 (222)
14-2-280	2765	1219	1607	356	1620	84	51.5	100	170	1005 (315)
14-2-300	2791	1219	1904	356	1950	96	59.1	130	190	1154 (362)
14-2-350	2863	1219	2116	356	2520	131	80.4	150	270	1571 (492)
18-2-235	2902	1266	1308	273	1345	68	41.7	82	135	814 (255)
18-2-280	2759	1266	2062	356	1800	97	59.2	130	190	1156 (362)
18-2-300	2902	1266	2062	356	2010	111	68.0	130	240	1327 (416)
18-2-350	2974	1377	1718	356	2920	151	92.5	170	300	1807 (566)
32-2-235	3222	1482	1607	356	1950	80	49.0	100	160	956 (300)
32-2-280	3222	1482	2062	356	2220	113	69.5	130	220	1357 (425)
32-2-300	3282	1482	2282	356	2430	130	79.8	150	260	1558 (488)
32-2-350	3393	1587	1926	356	3230	177	108.6	200	350	2121 (665)
50-2-235	3447	1516	1556	356	2400	85	54.4	100	170	1062 (333)
50-2-280	3509	1516	2282	356	2480	125	77.2	150	250	1508 (473)
50-2-300	3509	1619	1728	356	3180	144	88.6	170	290	1731 (542)
50-2-350	3509	1619	1728	457	4060	195	120.6	230	380	2356 (738)
80-2-300	4156	1778	1978	457	4280	170	103.4	200	350	2020 (633)

Table 23. Dimensions (mm)

Model	a	b	c	d	f	g	h	i	l	m	n	o	p	q	r	s	t	u
6-2-175	835	406	283	595	162	1292	480	228	1162	1214	179	11	412	561	185	455	560	634
6-2-200	690	443	360	631	70	1062	480	153	1253	1305	129	69	437	561	185	455	536	634
14-2-235	623	373	290	562	152	1860	543	393	1302	1361	368	308	420	660	200	630	823	-
14-2-280	635	388	305	577	148	1459	543	393	1353	1412	368	308	464	670	200	630	838	-
14-2-300	635	388	305	577	148	1756	543	393	1366	1425	368	308	464	670	200	630	838	-
14-2-350	625	378	295	567	148	1968	543	459	1402	1461	368	308	464	670	200	630	838	-
18-2-235	658	411	328	599	70	1238	600	401	1417	1485	364	304	416	666	230	630	838	-
18-2-280	625	378	300	556	148	1914	600	401	1346	1414	364	304	460	666	230	630	838	-
18-2-300	625	378	295	556	148	1914	600	401	1417	1485	364	304	460	666	230	630	838	-
18-2-350	625	378	295	556	148	1570	600	401	1453	1521	364	304	512	666	230	630	838	-
32-2-235	817	388	305	376	148	1459	660	430	1571	1651	554	374	610	816	270	630	854	-
32-2-280	625	378	300	567	148	1914	600	401	1571	1651	514	454	610	816	270	630	838	-
32-2-300	625	378	295	567	148	2134	660	317	1601	1681	514	454	610	816	270	630	838	-
32-2-350	625	378	295	567	148	1778	660	550	1657	1737	514	454	662	816	270	630	838	-
50-2-235	658	411	328	588	97	1459	709	393	1681	1766	356	296	599	803	300	860	955	43
50-2-280	783	533	449	724	148	1308	709	393	1615	1700	317	296	599	1140	300	860	955	43
50-2-300	783	535	452	724	148	2134	709	393	1712	1797	356	296	599	811	300	860	955	43
50-2-350	783	535	452	724	148	1744	709	393	1712	1797	356	296	650	811	300	860	955	43
80-2-300	783	535	452	724	148	1830	900	448	2029	2127	431	370	724	878	350	1100	1067	37

Mounting Dimensions

Figure 4. Actuator Models 0.3 to 6 (SCN6200E - Rev. 15/10/19)

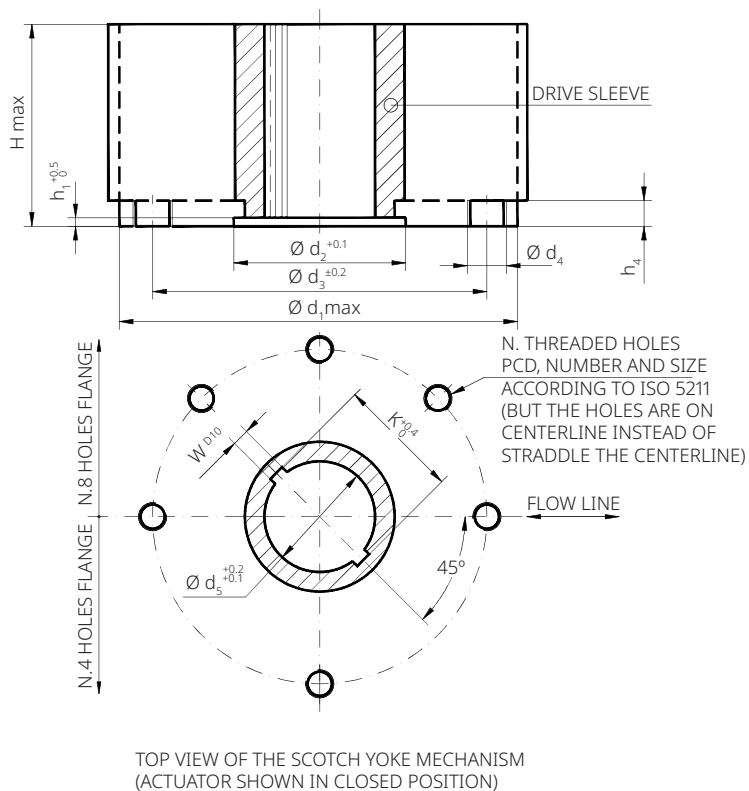


Table 24. Coupling Dimensions Models 0.3 to 0.6 (mm)

Actuator Model	Ø d ₁	Ø d ₂	Ø d ₃	Ø d ₄	N	h ₁	h ₂	H max	Ø d ₅	W	K
0.3	240	93	165	M20	4	5	17	127	70	12	75.6
0.9	310	112	254	M16	8	5	19	150	86	14	93.6
1.5	360	144	298	M20	8	6	19	190	112	18	119.0
3	430	195	356	M30	8	9	23	200	157	25	167.8
6	520	250	406	M36	8	14	29	260	200	28	212.8

NOTE:

Ø d₁ is maximum adapter flange diameter.

Figure 5. Actuator Model 14 (SCN6201E - Rev. 16/06/20)

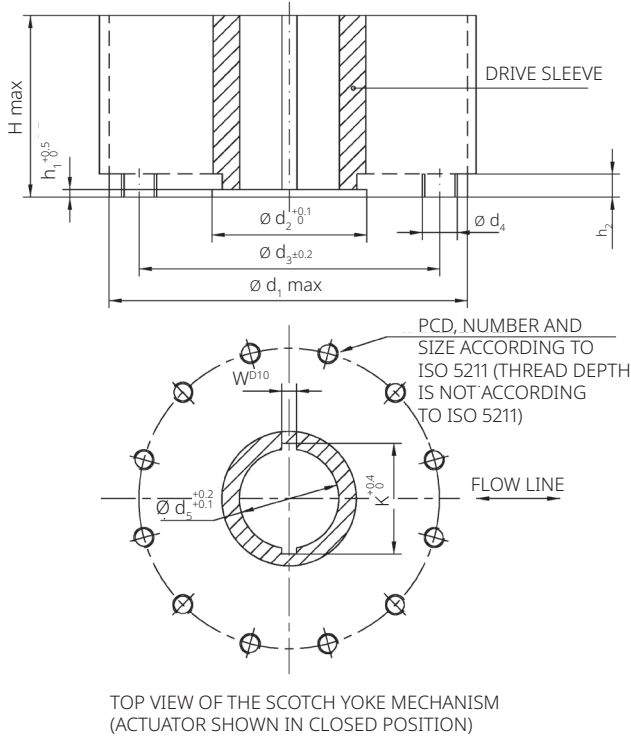


Figure 6. Actuator Models 18 and 32 (SCN6201E - Rev. 16/06/20)

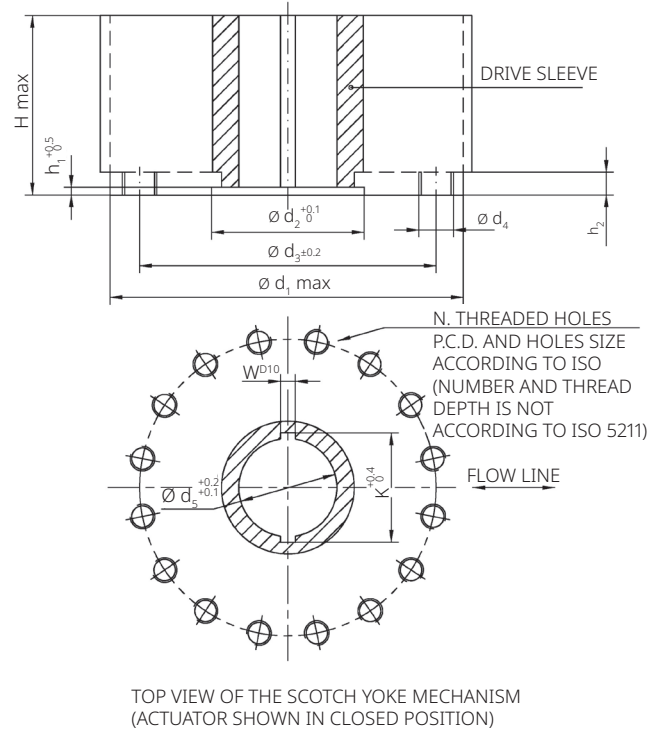


Table 25. Coupling Dimensions Model 14 (mm)

Actuator Model	$\varnothing d_1$	$\varnothing d_2$	$\varnothing d_3$	$\varnothing d_4$	N	h_2	h_2	H max	$\varnothing d_5$	W	K
14	580	250	483	M36	12	10	29	340	175	45	195.8

Table 26. Coupling Dimensions Models 18 and 32 (mm)

Actuator Model	$\varnothing d_1$	$\varnothing d_2$	$\varnothing d_3$	$\varnothing d_4$	N	h_2	h_2	H max	$\varnothing d_5$	W	K
18	680	290	603	M36	16	12	32	350	200	45	220.8
32	780	310	603	M36	16	12	32	400	220	50	242.8

NOTE:

$\varnothing d_1$ is maximum adapter flange diameter.

Figure 7. Actuator Model 50 (SCN62011 - Rev. 15/10/19)

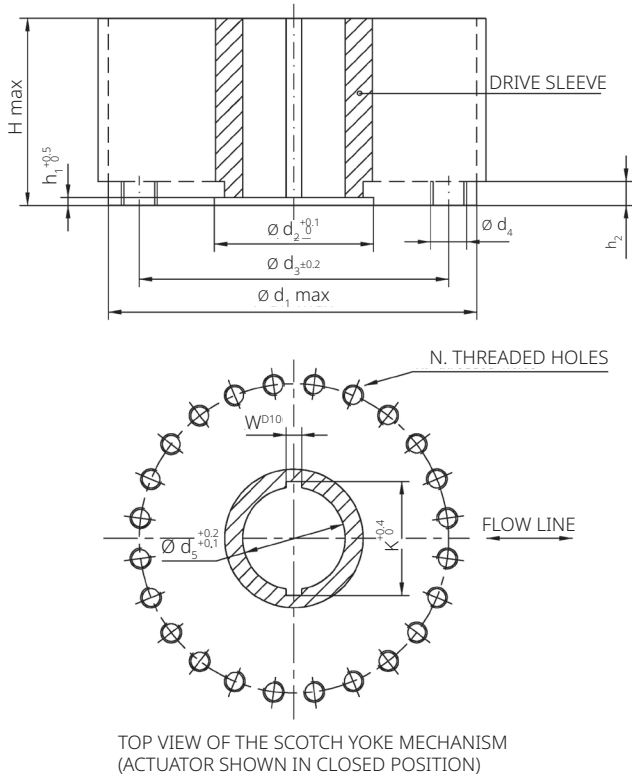


Figure 8. Actuator Models 65 and 80 (SCN62013 - Rev. 19/06/20)

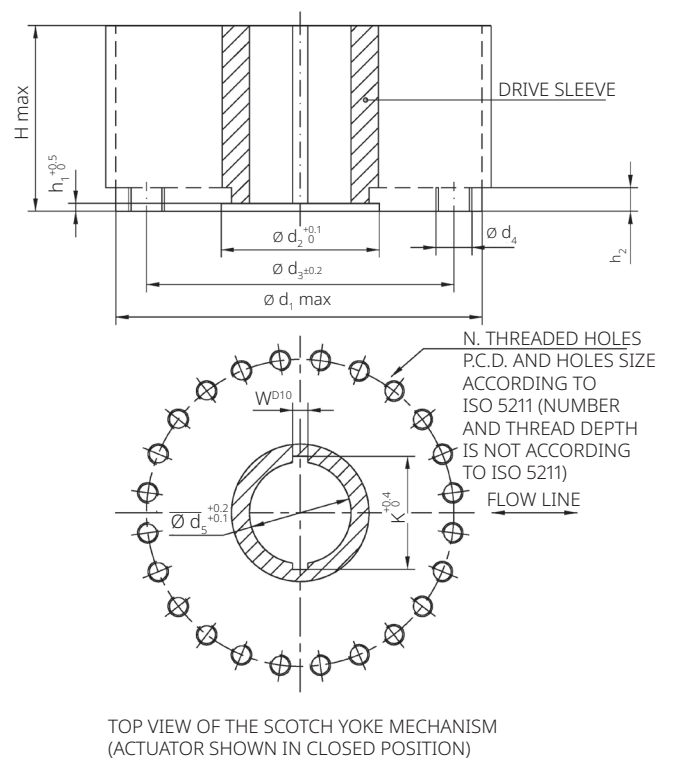


Table 27. Coupling Dimensions Model 50 (mm)

Actuator Model	$\varnothing d_1$	$\varnothing d_2$	$\varnothing d_3$	$\varnothing d_4$	N	h_2	h_2	H max	$\varnothing d_5$	W	K
50	800	315	698	M36	24	10	32	430	240	56	264.8

Table 28. Coupling Dimensions Models 65 and 80 (mm)

Actuator Model	$\varnothing d_1$	$\varnothing d_2$	$\varnothing d_3$	$\varnothing d_4$	N	h_2	h_2	H max	$\varnothing d_5$	W	K
65	910	370	813	M42	24	12	37	540	280	46	327.4
80	900	970	813	M42	24	12	37	540	280	46	327.4

NOTE:

$\varnothing d_1$ is maximum adapter flange diameter.

Figure 9. Actuator Model 100 (SCN62015 - Rev. 22/07/22)

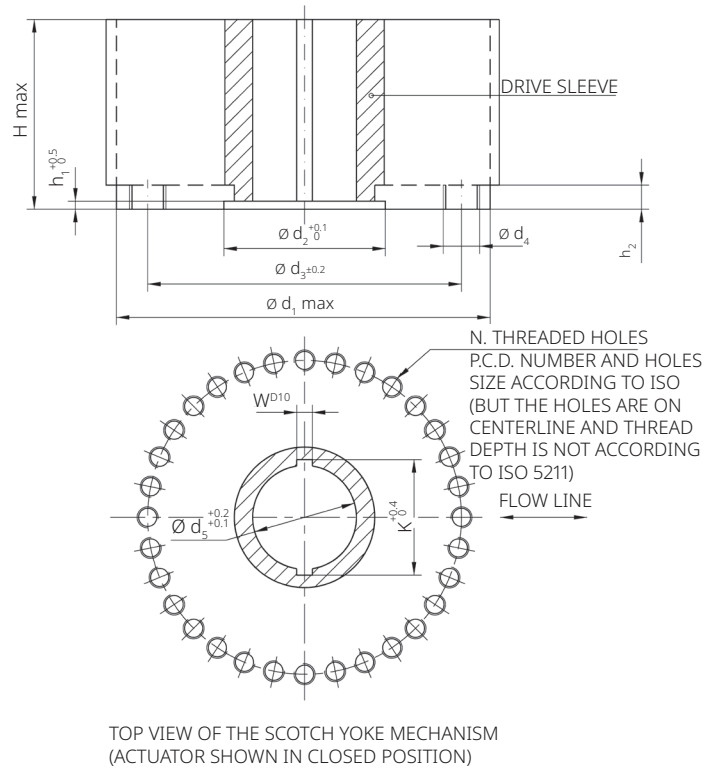


Table 29. Coupling Dimensions Model 100 (mm)

Actuator Model	$\varnothing d_1$	$\varnothing d_2$	$\varnothing d_3$	$\varnothing d_4$	N	h_2	h_2	H max	$\varnothing d_5$	W	K
100	1200	450	1042	M42	32	8	57	600	300	70	328.8

NOTE:

$\varnothing d_1$ is maximum adapter flange diameter.

Figure 10. Stem Acceptance

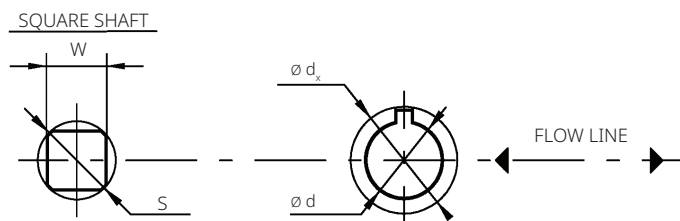


Table 30. Stem Acceptance Dimensions for Insert Bushes (mm)

Housing Size	Maximum Stem Diameter with Rectangular Key $d (bxh)^{[2]}$ (mm)	Maximum Accepted Diameter Described by the Key $dx^{[3]}$ (mm)	Maximum Accepted Square Stem (mm)		Maximum Accepted Square Stem Height (mm)**
			W	S*	
0.3	53 (16x10)	64	46	64	120
0.9	62 (18x11)	73	55	73	140
1.5	85 (22x14)	99	73	99	180
3	126 (32x18)	145	104	145	190
6	161 (40x22)	185	133	185	250
14	105 (28x16)	121	-	-	340
18	122 (32x18)	140	-	-	350
32	160 (40x22)	183	-	-	400
50	160 (40x22)	183	-	-	430
65	-	-	-	-	540
80	-	-	-	-	540
100	-	-	-	-	600

NOTES:

1. The listed maximum acceptance values are applicable for stems with keyways parallel or perpendicular to the flow line and for square stems with diagonal parallel with the flow line.
 2. Key according to UNI6604 or DIN 6885 sh.1 or ISO 773 or equivalent.
 3. For stem with key not correspondent to any specification, check the dimension dx .
- * S max: maximum external diameter in case of rounded edge.
 ** Without adapter flange.

Accessories Mounting Dimensions

Figure 11. Actuator Models 0.3 to 100

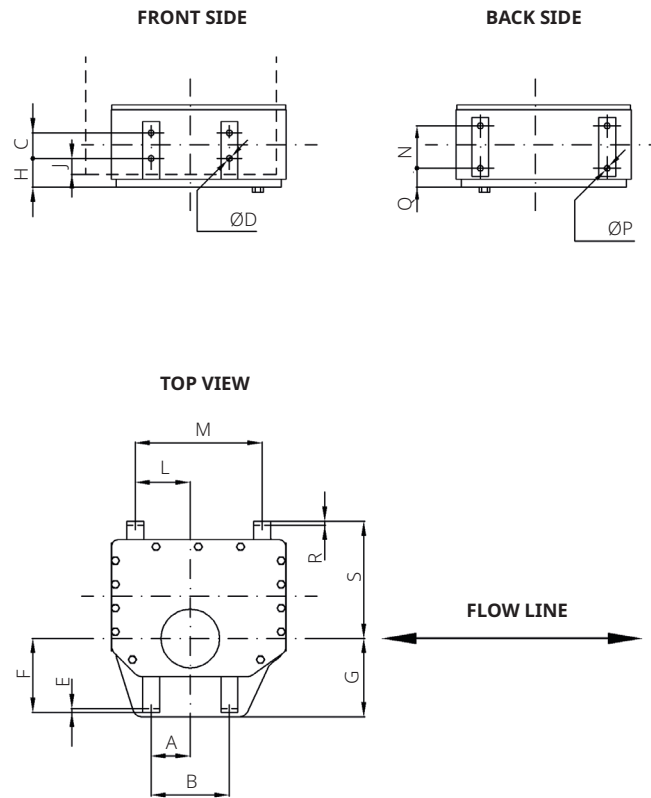


Table 31. Accessories Mounting Dimensions (mm)

Actuator Model	A	B	C	Ø D	E	F	G	H	J	L	M	N	Ø P	Q	R	S
0.3	77.5	155	60	14	5	113	119	37	12	92	200	60	14	36	5	200
0.9	92.5	185	60	14	5	155	170	61	35	85	200	60	14	48	5	243
1.5	92.5	185	60	14	5	175	185	62	35	130	300	100	14	45	5	284
3	117.5	235	85	23	8	203	215	57	25	230	500	100	14	54	5	371
6	137	455	115	23	8	248	260	59	22	224	500	100	14	87	8	480
14	315	630	200	27	10	227	330	97	55	220	500	170	27	99	8	543
18	315	630	200	27	10	235	340	72	32	306	680	215	27	80	10	600
32	315	630	200	27	10	385	395	72	32	414	890	215	27	149	10	660
50	387.5	860	250	30	12	372	387	77	35	473	1030	215	27	163	10	1072
65	391	860	250	30	15	380	455	107	50	474	1030	215	27	270	15	830
80	500	1000	250	30	15	437.5	450	107	50	500	1100	215	27	270	15	900
100	500	1100	250	30	20	564	600	127	50	500	1100	215	27	333	15	1275

Figure 12. Accessories Mounting Holes on Actuator Top (Cover and Yoke)

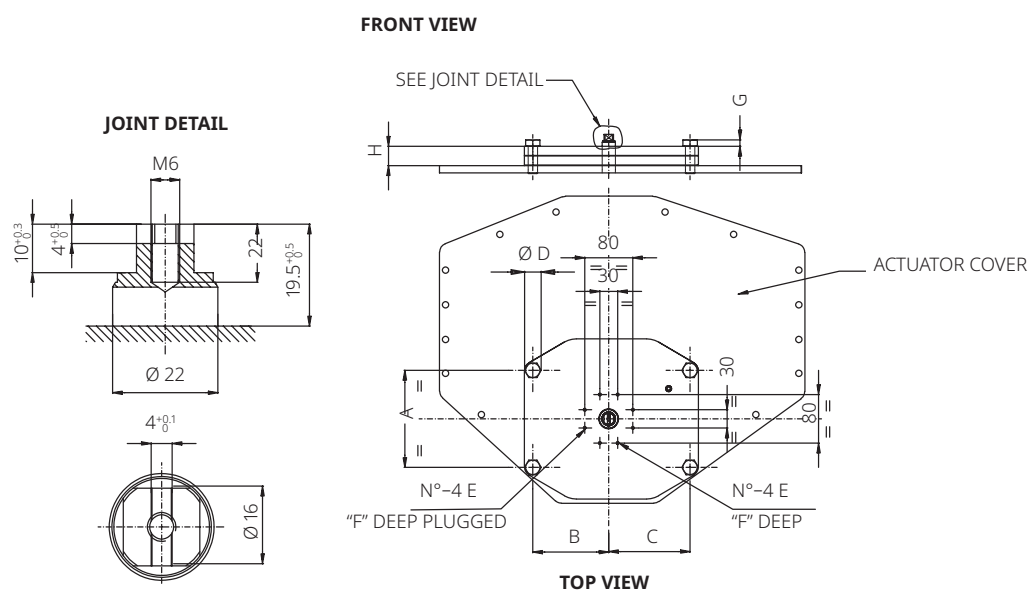
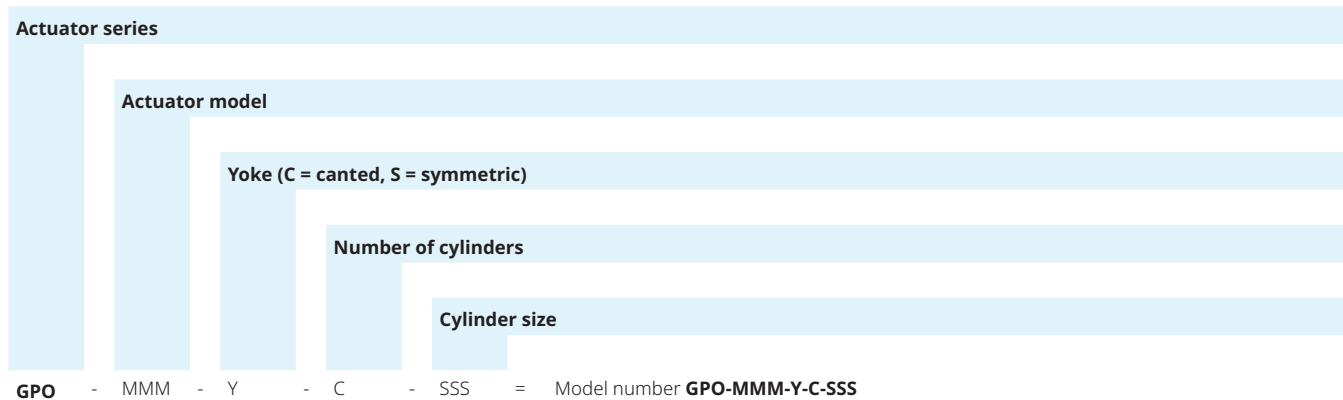


Table 32. Accessories Mounting Dimensions (mm)

Actuator Model	A	B	C	D	E	F	G	H
0.3	N/A	N/A	N/A	N/A	M5	9	N/A	32
0.9	N/A	N/A	N/A	N/A	M5	9	N/A	32
1.5	N/A	N/A	N/A	N/A	M5	9	N/A	32
3	160	127	136	30	M5	9	11	32
6	160	127	136	30	M5	9	11	32
14	160	127	136	30	M5	9	11	32
18	314	109	109	30	M5	9	11	29
32	314	109	109	30	M5	9	11	29
50	280.6	138.5	138.5	37	M5	9	13	32
65	410	180	180	44	M5	9	16	32
80	410	180	180	44	M5	9	16	32
100	460	205	205	44	M5	9	16	32

Model Decoding

Table 33. Double-Acting Gas Powered Actuator



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Biffi Italia s.r.l.
Strada Biffi 165
29017 Fiorenzuola d'Arda (PC)
Italy
T +39 0523 944 411

For complete list of sales and manufacturing sites, please visit
www.biffi.it or contact us at biffi_italia@biffi.it

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