

ELECTRIC MOTORS

INDUCTION MOTORS

Submersible induction motors are used as a drive of submersible pumps for pumping formation fluid from oil, water and geothermal wells.

Symba manufactures standard and high-voltage induction motors, Series 378 to 709, having a power range from 14 to 1,208 hp (at 60 Hz) with a speed control range of 2,100 - 4,200 rpm.

High voltage motors are electric motors with high voltage supply, which have smaller cross-section wires of the stator winding in comparison with a standard electric motor. Low operating current saves energy by reducing heat loss and voltage drop in the power cable line.

APPLICATION

- ☒ Wells with a high content of solids;
- ☒ Wells with a high gas content at the pump intake;
- ☒ Wells with high level of corrosiveness of formation fluid;
- ☒ Wells with high temperature of formation fluid;
- ☒ Traditional wells.

FEATURES AND BENEFITS:

- ☒ Manufacturing of stators using PPI-U (M) winding with insulation made of Kapton, Apikal polyamide-fluoroplastic film with a heat resistance up to 392°F (200°C);
- ☒ Vacuum method of stator impregnation with the VS-346 high-temperature varnish or the ELPLAST-180.220 compound;
- ☒ ENMAFLON fluoroplastic tubes as the stator slot insulation;
- ☒ Axial thrust bearings made of silicon carbide or coated with the PEEK material;
- ☒ Locking devices are used to prevent the rotation of radial bearings in the housing;
- ☒ When assembling the body parts of electric motors, the Fixator-2.3 sealant is used on all threaded connections to prevent unscrewing;
- ☒ High-temperature design of pot-head elements:
 - from the PPS-A4 material with an operating temperature of up to 482°F (250°C);
 - from the PEEK material with an operating temperature of up to 572°F (300°C).
- ☒ Heat-resistant rubber products that resistant to synthetic oils:
 - RS-3. Ter-10, up to 428°F (220°C);
 - AF-15, up to 482°F (250°C).

An induction motor is a bipolar oil-filled three-phase squirrel-cage motor. A wide range of motors of various power configuration allows to choose the optimal electric motor to ensure well operation at maximum efficiency.

The motor manufacturing technology ensures the high quality and reliability of submersible electric motors manufactured by Symba LLC.

All motors are assembled on special benches, where the quality of individual assemblies is controlled. After motors are tested on a test bench under conditions close to the real ones, including heating to operating temperatures. After testing, all motors are partially disassembled and the working components are carefully checked. Then they are finally assembled and tested.

Special electrotechnical materials usage makes possible to operate the motors of standard design in the wells with formation fluid temperatures up to 248°F (120°C), and up to 302°F (150°C) – for the high temperature design motors.





EXAMPLE

IM-A 461-200 1620V 76A UT CR1 T1

IM-	A	461-	200	HV	1620V	76A	UT	CR1	T1
1	2	3	4	5	6	7	8	9	10
1	IM – Induction motor								
2	Sympa design								
3	Motor series								
4	Motor power @ 60Hz, hp								
5	Voltage classification: Blank – standard LV – low voltage HV – high voltage								
6	Voltage, V								
7	Current, A								
8	Configuration S – single UT – upper tandem CT – central tandem LT – lower tandem T – tandem (2 or 3 sectioned complete motor)								
9	Corrosion resistance design: CR0 – carbon steel head, base and housing, carbon steel fasteners CR1 – stainless steel head and base, carbon steel housing with anti-corrosion coating (super stainless flame coating), monel fasteners CR2 – stainless steel head, base and housing, monel fasteners								
10	Ambient temperature rating T – for 248°F (120°C) T1 – for 302°F (150°C) T2 – for 338°F (170°C)								

378 SERIES STANDARD INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (Nº of sections)	Le	Length	Weight	
Power	Voltage	Power	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
25.7	600	16.0	500	30	S	11.0	3.4	375	170
35.4	774	22.0	645	31.5	S	13.2	4.0	454	206
45.1	948	28.0	790	32.6	S	15.5	4.7	540	245
51.5	900	32.0	750	38	S	16.6	5.1	591	268
57.9	1,200	36.0	1,000	33	S	18.8	5.7	664	301
64.4	1,380	40.0	1,150	32.5	S	21.1	6.4	739	335
90.2	1,872	56.0	1,560	33.5	T(2)	34.8	10.6	1,241	563
45.1	936	28.0	780	33.5	UT	17.4	5.3	624	283
45.1	936	28.0	780	33.5	LT	17.4	5.3	617	280
101.4	1,800	63.0	1,500	37	T(2)	32.8	10.0	1,102	500
50.7	900	31.5	750	37	UT	16.4	5.0	551	250
50.7	900	31.5	750	37	LT	16.4	5.0	551	250
112.6	2,304	70.0	1,920	34	T(2)	41.6	12.6	1,479	671
56.3	1152	35.0	960	34	UT	20.8	6.3	743	337
56.3	1152	35.0	960	34	LT	20.8	6.3	736	334

*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem

TECHNICAL DATA

Housing outer diameter	3.78 in.	96 mm
Maximum internal temperature	392°F	200°C
Involute spline type	1 in.	25 mm

406 SERIES STANDARD INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (Nº of sections)	Length		Weight	Weight
Power	Voltage	Power	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
25.7	636	16	530	25.6	S	9.9	3.0	353	160
35.4	840	22	700	27.5	S	12.1	3.7	441	200
45.1	1,080	28	900	27	S	14.3	4.4	529	240
51.5	1,200	32	1,000	27.5	S	15.4	4.7	573	260
57.9	1,200	36	1,000	33	S	17.7	5.4	661	300
64.4	1,440	40	1,200	30	S	17.7	5.4	661	300
72.4	1,560	45	1,300	31.2	S	19.9	6.1	747	339
80.5	1,680	50	1,400	32	S	19.9	6.1	747	339
90.1	1,920	56	1,600	32	S	21.0	6.4	789	358
101.4	2,100	63	1,750	32	S	22.1	6.7	831	377
112.6	2,280	70	1,900	30.2	S	23.2	7.1	877	398
128.7	2,460	80	2,050	36	S	26.7	8.1	893	405
144.8	2,376	90.0	1,980	40	T(2)	36.7	11.2	1,456	660
72.4	1,188	45.0	990	40	UT	18.0	5.5	728	330
72.4	1,188	45.0	990	40	LT	18.7	5.7	728	330
161.0	2,544	100.0	2,120	42	T(2)	39.0	11.8	1,500	680
80.5	1,272	50.0	1,060	42	UT	19.5	5.9	750	340
80.5	1,272	50.0	1,060	42	LT	19.5	5.9	750	340
177.0	2,472	110.0	2,060	49	T(2)	43.4	13.2	1,544	700
88.5	1,236	55.0	1,030	49	UT	21.7	6.6	772	350
88.5	1,236	55.0	1,030	49	LT	21.7	6.6	772	350
201.2	3,072	125.0	2,560	44	T(2)	45.6	14.0	1,610	730
100.6	1,536	62.5	1,280	44	UT	22.8	6.9	838	380
100.6	1,536	62.5	1,280	44	LT	22.8	7.1	772	350
225.2	3,000	140.0	2,500	51	T(2)	50.0	15.2	1,753	795
112.6	1,500	70.0	1,250	51	UT	25.0	7.5	882	400
112.6	1,500	70.0	1,250	51	LT	25.0	7.7	871	395
289.8	3,780	180.0	3,150	52	T(3)	64.3	19.6	2,338	1,060
96.6	1,260	60.0	1,050	52	UT	21.3	6.5	794	360
96.6	1,260	60.0	1,050	52	CT	21.0	6.4	772	350
96.6	1,260	60.0	1,050	52	LT	22.0	6.7	772	350

*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem

TECHNICAL DATA

Housing outer diameter	4.06 in.	103 mm
Maximum internal temperature	392°F	200°C
Involute spline type	1 in.	25 mm



406 SERIES HIGH-VOLTAGE INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (Nº of sections)	Length		Weight	Weight
Power	Voltage	Power	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
25.7	2,220	16.0	1,850	8.2	S	10.7	3.3	459	208
32.2	2,700	20.0	2,250	8.5	S	11.8	3.6	483	219
35.4	2,820	22.0	2,350	9	S	11.8	3.6	483	219
38.6	3,120	24.0	2,600	8.5	S	12.9	3.9	498	226
45.1	2,520	28.0	2,100	12.5	S	14.1	4.3	520	236
51.5	2,820	32.0	2,350	12.5	S	15.2	4.6	562	255
57.9	3,060	36.0	2,550	13	S	16.3	5.0	597	271
64.4	2,520	40.0	2,100	17.5	S	17.4	5.3	659	299
72.4	2,880	45.0	2,400	17	S	19.6	6.0	741	336
80.5	3,120	50.0	2,600	17.5	S	20.8	6.3	776	352
90.1	3,300	56.0	2,750	19	S	20.8	6.3	776	352
101.4	3,000	63.0	2,500	24	S	24.1	7.3	919	417
112.6	3,096	70.0	2,580	25.5	S	26.3	8.0	994	451
128.7	3,120	80.0	2,600	28	S	28.6	8.7	1,089	494
144.8	3,480	90.0	2,900	28	T(2)	39.0	11.9	1,479	671
72.4	1,740	45.0	1,450	28	UT	19.3	5.9	745	338
72.4	1,740	45.0	1,450	28	LT	19.7	6.0	734	333
161.0	3,840	100.0	3,200	29	T(2)	41.0	12.5	1,589	721
80.5	1,920	50.0	1,600	29	UT	20.3	6.2	800	363
80.5	1,920	50.0	1,600	29	LT	20.7	6.3	789	358
177.0	4,080	110.0	3,400	29.5	T(2)	43.0	13.1	1,625	371
88.5	2,040	55.0	1,700	29.5	UT	21.3	6.5	818	371
88.5	2,040	55.0	1,700	29.5	LT	21.7	6.6	807	366
201.2	4,032	125.0	3,360	34.5	T(2)	45.3	13.8	1,674	737
100.6	2,016	62.5	1,680	34.5	UT	22.3	6.8	840	381
100.6	2,016	62.5	1,680	34.5	LT	23.0	7.0	831	377
225.2	4,380	140.0	3,650	36	T(2)	49.9	15.2	1,717	779
112.6	2,190	70.0	1,825	36	UT	24.6	7.5	864	392
112.6	2,190	70.0	1,825	36	LT	25.3	7.7	853	387
241.4	4,584	150.0	3,820	36	T(2)	49.9	15.2	1,753	795
120.7	2,292	75.0	1,910	36	UT	24.6	7.5	882	400
120.7	2,292	75.0	1,910	36	LT	25.3	7.7	871	395

*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem

TECHNICAL DATA

Housing outer diameter	4.06 in.	103 mm
Maximum internal temperature	392°F	200°C
Involute spline type	1 in.	25 mm



461 SERIES STANDARD INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (Nº of sections)	Le	ngth	Weight	
Power	Voltage	Power	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
19.3	456	12.0	380	26	S	7.0	2.1	291	132
25.7	900	16.0	750	18	S	8.2	2.5	357	162
32.2	756	20.0	630	27	S	9.4	2.9	419	190
35.4	900	22.0	750	24	S	10.7	3.3	503	228
38.6	960	24.0	800	25	S	10.7	3.3	481	218
45.1	1,080	28.0	900	26	S	11.9	3.6	542	246
51.5	1,200	32.0	1,000	26	S	13.2	4.0	604	274
57.9	1,440	36.0	1,200	25	S	14.4	4.4	666	302
64.4	1,440	40.0	1,200	27	S	15.6	4.8	728	330
64.4	1,536	40.0	1,280	26	S	15.6	4.8	728	330
72.4	1,680	45.0	1,400	26	S	16.9	5.2	789	358
80.5	1,680	50.0	1,400	28	S	18.2	5.5	858	389
90.1	1,680	56.0	1,400	32	S	19.4	5.9	922	418
101.4	2,202	63.0	1,835	28.7	S	20.5	6.3	974	442
101.4	2,400	63.0	2,000	25	S	20.5	6.3	974	442
112.6	2,280	70.0	1,900	30	S	23.2	7.1	1,098	498
112.6	2,460	70.0	2,050	28	S	23.2	7.1	1,098	498
128.7	2,220	80.0	1,850	36.5	S	24.4	7.4	1,160	526
144.8	2,280	90.0	1,900	39	S	25.6	7.8	1,221	554
160.9	2,520	100.0	2,100	40	S	26.9	8.2	1,259	571
177.0	2,760	110.0	2,300	40	S	26.9	8.2	1,259	571
177.0	2,760	110.0	2,300	40	T(2)	31.7	9.7	1,515	687
88.5	1,380	55.0	1,150	40	UT	16.0	4.9	761	345
88.5	1,380	55.0	1,150	40	LT	15.7	4.8	754	342
201.2	2,880	125.0	2,400	44	S	26.9	8.2	1,259	571
201.2	2,400	125.0	2,000	51.5	T(2)	42.8	13.0	2,004	909
100.6	1,200	62.5	1,000	51.5	UT	21.4	6.6	1,008	457
100.6	1,200	62.5	1,000	51.5	LT	21.4	6.4	996	452
225.2	3,120	140.0	2,600	45.5	T(2)	39.4	12.0	1,885	855
112.6	1,560	70.0	1,300	45.5	UT	19.7	6.0	946	429
112.6	1,560	70.0	1,300	45.5	LT	19.7	6.0	939	426
257.4	2,760	160.0	2,300	61	T(2)	44.4	13.6	2,132	967
128.7	1,380	80.0	1,150	61	UT	22.2	6.8	1,069	485
128.7	1,380	80.0	1,150	61	LT	22.2	6.8	1,063	482
289.6	2,760	180.0	2,300	65	T(2)	47.0	14.4	2,255	1,023
144.8	1,380	90.0	1,150	65	UT	23.5	7.2	1,131	513
144.8	1,380	90.0	1,150	65	LT	23.5	7.2	1,124	510



461 SERIES STANDARD INDUCTION MOTORS

60 Hz		50 Hz		Amperage	Type (Nº of sections)	Le	ngth	Weight	
Power	Voltage	Power	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
321.8	3,000	200.0	2,500	66.5	T(2)	52.0	15.8	2,502	1,135
160.9	1,500	100.0	1,250	66.5	UT	26.0	7.9	1,254	569
160.9	1,500	100.0	1,250	66.5	LT	26.0	7.9	1,248	566
354.0	3,240	220.0	2,700	68	T(2)	54.4	16.6	2,626	1,191
177.0	1,620	110.0	1,350	68	UT	27.2	8.3	1,316	597
177.0	1,620	110.0	1,350	68	LT	27.2	8.3	1,310	594
402.4	3,360	250.0	2,800	75	T(2)	56.8	17.3	2,615	1,186
201.2	1,680	125.0	1,400	75	UT	28.9	8.8	1,303	591
201.2	1,680	125.0	1,400	75	LT	27.9	8.5	1,312	595
482.7	3,600	300.0	3,000	85	T(3)	74.8	22.8	3,609	1,637
160.9	1,200	100.0	1,000	85	UT	24.9	7.6	1,195	542
160.9	1,200	100.0	1,000	85	CT	24.6	7.5	1,195	542
160.9	1,200	100.0	1,000	85	LT	25.3	7.7	1,219	553
579.3	4,428	360.0	3,690	87	T(3)	82.7	25.2	3,943	1,789
193.1	1,476	120.0	1,230	87	UT	27.6	8.4	1,318	598
193.1	1,476	120.0	1,230	87	CT	27.2	8.3	1,318	598
193.1	1,476	120.0	1,230	87	LT	27.9	8.5	1,307	593

TECHNICAL DATA

Housing outer diameter	4.61 in.	117 mm
Maximum internal temperature	392°F	200°C
Involute spline type	1.1 in.	28 mm

461 SERIES HIGH-VOLTAGE INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (Nº of sections)	Length ft	Length m	Weight lb	Weight kg
Power hp	Voltage V	Power kW	Voltage V						
25.7	2,220	16.0	1,850	7.2	S	8.2	2.5	368	167
32.2	2,760	20.0	2,300	7.5	S	9.1	2.8	465	211
35.4	3,120	22.0	2,600	7	S	10.7	3.3	465	211
38.6	3,240	24.0	2,700	7.5	S	10.3	3.2	474	215
45.1	2,280	28.0	1,900	12	S	11.9	3.6	553	251
51.5	2,652	32.0	2,210	12	S	13.2	4.0	626	284
57.9	2,724	36.0	2,270	13.5	S	14.1	4.3	672	305
64.4	2,460	40.0	2,050	16.5	S	15.6	4.8	752	341
72.4	2,700	45.0	2,250	16.5	S	16.9	5.2	811	368
80.5	3,000	50.0	2,500	17	S	18.1	5.5	820	372
90.1	3,276	56.0	2,730	17	S	19.4	5.9	902	409
101.4	3,240	63.0	2,700	19.5	S	21.9	6.7	1025	465
112.6	3,240	70.0	2,700	21.5	S	23.1	7.1	1089	494
128.7	3,276	80.0	2,730	25	S	24.4	7.4	1153	523
144.8	3,588	90.0	2,990	25	S	25.6	7.8	1206	547
160.9	3,192	100.0	2,660	31.5	S	26.9	8.2	1270	576
177.0	3,324	110.0	2,770	34	S	26.9	8.2	1270	576
201.2	3,900	125.0	3,250	31.5	S	27.8	8.5	1338	607
225.2	4,080	140.0	3,400	34	T(2)	39.0	11.9	1,937	876
112.6	2,040	70.0	1,700	34	UT	19.7	6.0	974	442
112.6	2,040	70.0	1,700	34	LT	19.3	5.9	957	434

*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem

TECHNICAL DATA

Housing outer diameter	4.61 in.	117 mm
Maximum internal temperature	392°F	200°C
Involute spline type	1.1 in.	28 mm



512 SERIES STANDARD INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (Nº of sections)	Length		Weight	
Power	Voltage	Power	Voltage			ft	m	lb	kg
hp	V	kW	V	A					
35.4	960	22.0	800	23	S	6.6	2.0	357	162
51.5	1,440	32.0	1,200	22	S	8.2	2.5	421	191
64.4	1,560	40.0	1,300	26	S	8.2	2.5	421	191
120.7	1,800	75.0	1,500	40	S	13.1	4.0	833	378
144.8	1,920	90.0	1,600	46	S	14.7	4.5	814	369
201.2	2,160	125.0	1,800	56	S	21.2	6.5	1,369	621
241.4	3,240	150.0	2,700	45	S	24.4	7.4	1,409	639
257.4	2,640	160.0	2,200	62	T(2)	35.0	10.6	1,909	866
128.7	1,320	80.0	1,100	62	UT	17.5	5.3	970	440
128.7	1,320	80.0	1,100	62	LT	17.5	5.3	939	426
289.6	3,240	180.0	2,700	62	T(2)	38.4	11.6	2,325	1,055
144.8	1,620	90.0	1,350	62	UT	19.2	5.8	1,168	530
144.8	1,620	90.0	1,350	62	LT	19.2	5.8	1,157	525
321.8	2,640	200.0	2,200	76	T(2)	41.6	12.6	2,525	1,145
160.9	1,320	100.0	1,100	76	UT	20.8	6.3	1,268	575
160.9	1,320	100.0	1,100	76	LT	20.8	6.3	1,257	570
354.0	2,880	220.0	2,400	80	T(2)	41.6	12.6	2,525	1,145
177.0	1,440	110.0	1,200	80	UT	20.8	6.3	1,268	575
177.0	1,440	110.0	1,200	80	LT	20.8	6.3	1,257	570
370.2	3,000	230.0	2,500	73	T(2)	35.0	10.6	2,085	946
185.1	1,500	115.0	1,250	73	UT	17.5	5.3	1,058	480
185.1	1,500	115.0	1,250	73	LT	17.5	5.3	1,027	466
402.4	3,360	250.0	2,800	72	T(2)	38.2	11.6	2,262	1,026
201.2	1,680	125.0	1,400	72	UT	19.1	5.8	1,146	520
201.2	1,680	125.0	1,400	72	LT	19.1	5.8	1,116	506
482.8	3,600	300.0	3,000	85.7	T(2)	51.4	15.6	3,119	1,415
241.4	1,800	150.0	1,500	85.7	UT	25.7	7.8	1,565	710
241.4	1,800	150.0	1,500	85.7	LT	25.7	7.8	1,554	705
515.0	3,360	320.0	2,800	95	T(2)	48.2	14.8	2,888	1,310
257.5	1,680	160.0	1,400	95	UT	24.1	7.4	1,455	660
257.5	1,680	160.0	1,400	95	LT	24.1	7.4	1,433	650
579.4	3,600	360.0	3,000	99	T(2)	51.4	15.6	3,064	1,390
289.7	1,800	180.0	1,500	99	UT	25.7	7.8	1,543	700
289.7	1,800	180.0	1,500	99	LT	25.7	7.8	1,521	690
740.1	3,840	460.0	3,200	115	T(3)	72.0	21.9	4,258	1,931
246.7	1,280	153.3	1,066.7	115	UT	24.0	7.3	1,462	663
246.7	1,280	153.3	1,066.7	115	CT	24.0	7.3	1,453	659
246.7	1,280	153.3	1,066.7	115	LT	24.0	7.3	1,343	609



60 Hz		50 Hz		Amperage	Type (Nº of sections)	Le	ngth	Weight	
Power	Voltage	Power	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
804.6	4,320	500.0	3,600	120	T(3)	76.7	23.3	4,532	2,056
268.2	1,440	166.7	1,200	120	UT	25.3	7.7	1,554	705
268.2	1,440	166.7	1,200	120	CT	25.7	7.8	1,543	700
268.2	1,440	166.7	1,200	120	LT	25.7	7.8	1,435	651
885.0	5,400	550.0	4,500	100	T(3)	76.5	23.3	4,273	1,938
295.0	1,800	183.3	1,500	100	UT	25.3	7.7	1,473	668
295.0	1,800	183.3	1,500	100	CT	25.3	7.7	1,433	650
295.0	1,800	183.3	1,500	100	LT	25.9	7.9	1,367	620

*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem.

TECHNICAL DATA

Housing outer diameter	5.12 in.	130 mm
Maximum internal temperature	392°F	200°C
Involute spline type	1.49 in.	38 mm

709 SERIES STANDARD INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (Nº of sections)	Le	ngth	Weight	
Power	Voltage	Power	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
201.2	2,760	125.0	2,300	41	S	11.8	3.6	1,433	650
402.4	2,760	250.0	2,300	80	S	20.0	6.1	2,403	1,090
804.6	3,000	500.0	2,500	145	T(2)	41.0	12.5	4,762	2,160
402.3	1,500	250.0	1,100	145	UT	20.7	6.3	2,403	1,090
402.3	1,500	250.0	1,100	145	LT	20.3	6.2	2,359	1,070
1,142.0	3,840	700.0	3,200	171	T(2)	44.6	13.6	5,180	2,350
571.0	1,920	350.0	1,350	145	UT	22.3	6.8	2,600	1,180
571.0	1,920	350.0	1,350	171	LT	22.3	6.8	2,580	1,170

*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem.

TECHNICAL DATA

Housing outer diameter	7.09 in.	180 mm
Maximum internal temperature	392°F	200°C
Involute spline type	1.89 in.	48 mm

PERMANENT MAGNET MOTORS

Submersible PMM motors are used as an energy-efficient drive of centrifugal pumps for pumping formation fluid from oil, water and geothermal wells.

Symba produces high-speed PM motors, Series 319, with a power range of 43 to 170 hp (at 6,000 rpm) having a speed control range of 4,000 - 6,000 rpm.

Series 319 motors are used for Series 319 high-speed electric submersible pumps.

APPLICATION

- Exploratory wells;
- Wells with sidetracks;
- Wells that under workover with a production string having a reduced internal diameter;
- Highly crooked and horizontal wells;
- Traditional wells.

FEATURES AND BENEFITS:

- High energy efficiency, no electric losses in a rotor, low values of no-load currents and operating currents;
- Reduce power consumption;
- A significant dependence of operating current on motor load;
- Makes it possible to accurately measure the load on the drive and optimize its operation mode;
- Low dependence of torque on rotational speed;
- Allows using the PMM in wells with harsh conditions, a high temperature of formation fluid and in wells with unstable inflow;
- Low motor heating;
- Increases service life, allowing the motor to work in conditions with a significant overload;
- High torque overload capacity and motor speed control;
- Ensure quick ESP rump up;
- Minimum weight and dimensions;
- Make it possible to apply the electric centrifugal pumps in highly deviated.

The PMM is a synchronous four-pole oil-filled three-phase motor whose rotor packs are made of permanent magnets.

PMM with permanent magnets do not consume power for energy transfer to the rotor and have no corresponding losses typical for induction electric motors. Therefore, the efficiency of PMMs is higher than the efficiency of induction motors, while the values of operating currents and no-load currents are lower.

The high efficiency and low values of PMMs operating currents, combined with the ability to control the rotational speed, reduce energy consumption by 10-35% during ESP operation.

Under equal operating conditions, an ESP with the PMM has a higher MTBF than an ESP with an induction motor due to lower motor overheating, the possibility to control its speed and soft start-up modes.

Using special purpose electrical engineering materials makes it possible to operate the motors in wells with formation fluid temperatures up to 338°F (170°C) in the high temperature design, and up to 248°F (120°C) in the standard version.



EXAMPLE

PMM-A 319-80-6 2910V 18.5A S CR1 T1

PMM-	A	461-	72.4	3600	1764V	21A	S	CR1	T1
1	2	3	4	5	6	7	8	9	10
1	PMM – Permanent magnet motor								
2	Alnas design								
3	Motor series								
4	Motor power, hp								
5	Motor nameplate nominal frequency: Blank – at 3600 RPM 6 – at 6000 RPM								
6	Voltage, V								
7	Current, A								
8	S – single								
9	Corrosion resistance design: CR0 – carbon steel head, base and housing, carbon steel fasteners CR1 – stainless steel head and base, carbon steel housing with anti-corrosion coating (super stainless flame coating), monel fasteners CR2 – stainless steel head, base and housing, monel fasteners								
10	Ambient temperature rating T – for 248°F (120°C) T1 – for 302°F (150°C) T2 – for 338°F (170°C)								



319 SERIES PERMANENT MAGNET MOTORS

CONTROL RANGE: 4,000-6,000 RPM

6,000 RPM			Amperage	Type (Nº of sections)	Length			Weight	
Power		Voltage							
hp	kW	V	A		ft		m	lb	kg
43.5	32	1,200	23	S	12.4		3.8	366	166
54.4	40	1,350	23	S	13.6		4.1	401	182
67.0	50	1,700	23	S	17.7		5.4	467	212
85.6	63	2,200	23	S	25.6		7.8	569	258
122.4	90	2,950	21	S	27.5		8.4	736	334
170.0	125	2,550	34	S	36.4		11.0	864	392

*S-Single

TECHNICAL DATA

Housing outer diameter	3.19 in.	81 mm
Maximum internal temperature	392°F	200°C
Involute spline type	0.79 in.	20 mm

461 SERIES PERMANENT MAGNET MOTORS

CONTROL RANGE: 2,100-4,200 RPM

3,600 RPM		3,000 RPM		Amperage	Type (Nº of sections)	Length		Weight	
Power	Voltage	Power	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
38.6	924	24	770	21.5	S	6.4	1.9	295	134
45.1	1,146	28	955	20	S	7.2	2.2	335	152
51.5	1,236	32	1,030	21	S	7.4	2.3	348	158
64.4	1,584	40	1,320	21	S	8.6	2.6	403	183
72.4	1,764	45	1,470	21	S	9.3	2.8	434	197
80.5	2,076	50	1,730	20	S	10.3	3.1	485	220
90.1	2,292	56	1,910	20	S	11.0	3.3	516	234
101.4	2,556	63	2,130	20	S	11.9	3.6	560	254
112.6	2,814	70	2,345	20.5	S	12.8	3.9	604	274
128.7	3,174	80	2,645	20.5	S	14.0	4.3	659	299
144.8	3,432	90	2,860	21.5	S	14.9	4.5	703	319
160.9	3,666	100	3,055	22	S	15.8	4.8	739	335
177.0	4,014	110	3,345	22.5	S	16.9	5.1	787	357
201.2	3,534	125	2,945	29	S	18.3	5.6	866	393
225.2	3,876	140	3,230	29	S	20.0	6.1	946	429
289.6	3,240	180	2,700	45.9	S	22.3	6.8	1,047	475
321.8	3,000	200	2,500	56.2	S	24.0	7.3	1,080	490
402.4	3,720	250	3,100	57	S	26.9	8.2	1,213	550

*S-Single

TECHNICAL DATA

Housing outer diameter	4.16 in.	117 mm
Maximum internal temperature	392°F	200°C
Involute spline type	1.1 in.	28 mm