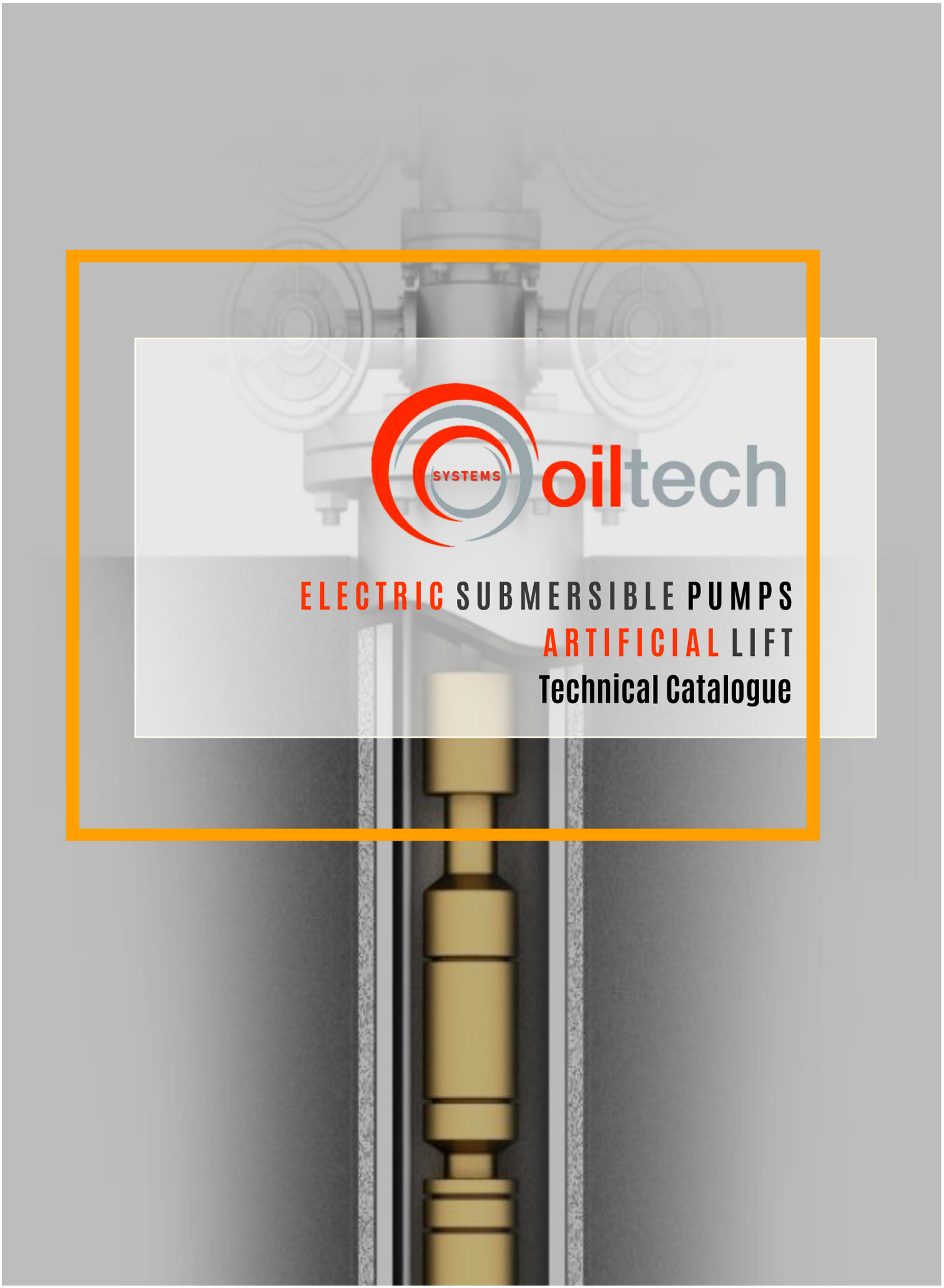

SYSTEMS oiltech

ELECTRIC SUBMERSIBLE PUMPS
ARTIFICIAL LIFT
Technical Catalogue

quality integrity innovations

Our Company

OILTECHSYSTEMS OÜ is a part of SIEBC group of companies working in the energy industry for more than 20 years which produce, engineer and develop systems with the most advanced technologies for the conduction and storage of all kind of fluids at high pressures and temperatures.

The group is working worldwide providing services, installations, products and performing turn key projects.

quality integrity innovations

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quality integrity innovations

ELECTRIC SUBMERSIBLE PUMPS

Submersible centrifugal pumps are used for pumping formation fluid from oil wells, as well as in reservoir pressure maintenance systems.

Flowrate/production boosting

Wells with a high content of solids;
Wells with a high GOR;
Wells with high corrosiveness of formation fluid;
Wells with high temperature of formation fluid;
Wells after hydraulic fracturing;
Wells after drilling, including horizontal, with sidetracks, exploratory and crooked borehole wells;
Traditional wells.

FEATURES AND BENEFITS:

Corrosion-resistant, corrosion-wear-resistant, and increased corrosion resistance pumps with stage material hardness of up to 240 HB;

Corrosion-wear-resistant design of the pump housing, corrosion-wear-resistant coating of the housing or stainless steel housing;

Floating, compression and packet design pumps;

Simplified installation of compression design pumps. The shafts in pump sections can contact each other by means of an adjustment bolt, which is fixed by the sleeve to prevent unscrewing. A special device is used for the bolt adjustment procedure during installation, while the process does not involve any measuring tools;

Optimal destribution of radial bearings through pump section; center bearings in pumps with a capacity of more than 1900 barrels/day (300 m3/day) at 60 Hz are built into the stage;

Shafts are made of high-strength stainless steel;

Involute spline connection of shafts;

Our partner produces standard and high-speed pumps with floating stages or compression-assembled pumps with a capacity of 76 to 11,725 barrels/day (12 - 1,864 m3/day) at 60 Hz with a speed control range of 2,400 - 6,000 rpm.

Floater design pumps: the impellers on the shaft inside the diffusers can move in axial directions within the permissible gap. The axial Load of the shaft is transmitted to the motor protector bearing, while the axial load of the impellers is transmitted to the diffusers.

Compression design pumps: The impellers are fixed to the shaft and move up and down with it. The axial load form the shaft and the impellers is transmitted to the motor protector bearing. Thrust bearing of the motor protector has a low coefficient of friction and is not subject to abrasion wear and the adverse effect of formation fluid.

ELECTRIC SUBMERSIBLE PUMPS SUMMARY

EXAMPLE

ESP-OS A 406-950 84STG C UT 5M STD CR1 HSN

ESP	OS	A	406-	950	HS	CCW	84STG	C	UT	5M	STD	CR1	HSN
1	1.1	2	3	4	5	6	7	8	9	10	11	12	13

1	Electric Submersible Pump (ESP)
1.1	Brand name - Oiltechsystems
2	Alnas design
3	ESP series
4	ESP flow rate, bpd @ Best Efficiency Point (BEP) at 60 Hz (at 6,000 rpm for HS pump)
5	Speed classification: Blank - standard HS - high speed
6	Rotation direction: Blank – clockwise CCW - counter-clockwise
7	Number of stages
8	Pump design: C – compression F – floater P - packet
9	Pump configuration: UT - upper tandem CT - central tandem LT - lower tandem
10	Housing length, m
11	Shaft rating: STD - Standard strength shaft HSS - High strength shaft USS - Ultrahigh strength shaft
12	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
13	Elastomers material: HSN - highly saturated nitrile AFL - high temperature fluoroelastomer

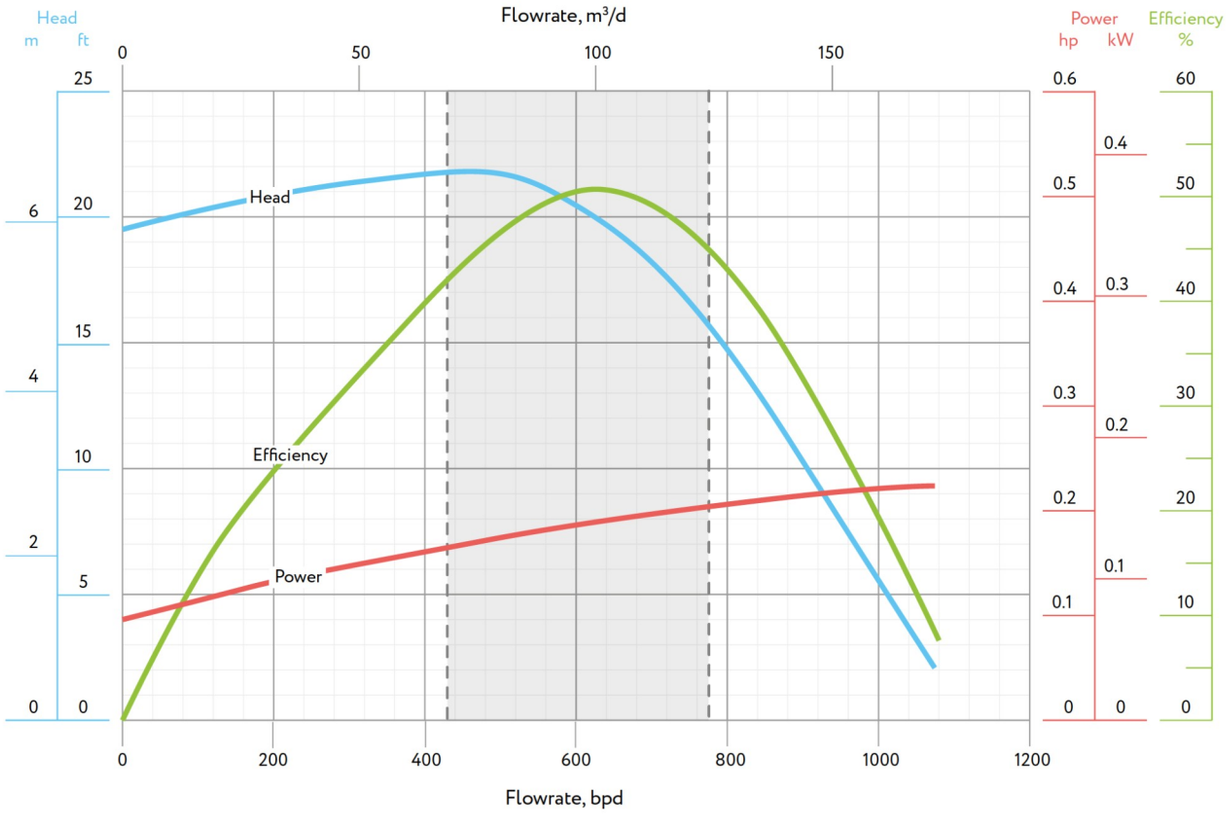
ELECTRIC SUBMERSIBLE PUMPS SUMMARY

Pump	Stage Type	Housing Diameter, in. (mm)	60 Hz - 3,500 rpm		50 Hz - 2,917 rpm	
			Recommended Operating Range		Recommended Operating Range	
			bpd	rpm	m3/d	rpm
ESP-OS A 272-900 HS	radial	2.72 (69.0)	432 - 778	4,000	69 - 124	4,000
			450 - 809	4,160	71 - 129	4,160
			539 - 971	4,990	86 - 154	4,990
			646 - 1,163	5,980	103 - 185	5,980
ESP-OS A 319-550 HS	radial	3.19 (81.0)	219 - 546	4,050	35 - 87	4,050
			245 - 611	4,530	39 - 97	4,530
			279 - 697	5,170	44 - 111	5,170
			314 - 786	5,820	50 - 125	5,820
ESP-OS A 338-150	radial	3.38 (86.0)	91 - 204	3,500	12 - 27	2,917
ESP-OS A 338-300	radial		212 - 393		28 - 52	
ESP-OS A 338-400	radial		284 - 473		38 - 63	
ESP-OS A 338-550	radial		454 - 756		60 - 100	
ESP-OS A 362-130	radial	3.62 (92.0)	76 - 170	3,500	10 - 23	2,917
ESP-OS A 362-170	radial		113 - 197		15 - 26	
ESP-OS A 362-200	radial		136 - 287		18 - 38	
ESP-OS A 362-270	radial		189 - 340		25 - 45	
ESP-OS A 362-400	radial		227 - 530		30 - 70	
ESP-OS A 362-410	radial		303 - 567		40 - 75	
ESP-OS A 362-600	radial		454 - 756		60 - 100	
ESP-OS A 362-750	radial		605 - 946		80 - 125	
ESP-OS A 362-950	radial		605 - 1,210		80 - 160	
ESP-OS A 362-1200	radial		908 - 1,513		120 - 200	
ESP-OS A 362-1400	radial		983 - 1,740		130 - 230	
ESP-OS A 362-2100	mixed flow		1,589 - 2,648		210 - 350	
ESP-OS A 406-270	radial	4.06 (103.0)	189 - 340	3,500	25 - 45	2,917
ESP-OS A 406-400	radial		189 - 605		25 - 80	
ESP-OS A 406-450	radial		303 - 605		40 - 80	
ESP-OS A 406-600	radial		454 - 756		60 - 100	
ESP-OS A 406-700	radial		530 - 983		70 - 130	
ESP-OS A 406-900	radial		567 - 1,324		75 - 175	
ESP-OS A 406-1250	radial		908 - 1,513		120 - 200	
ESP-OS A 406-1500	radial		946 - 1,891		125 - 250	
ESP-OS A 406-1900	radial		1,362 - 2,269		180 - 300	
ESP-OS A 406-1950	mixed flow		1,437 - 2,572		190 - 340	
ESP-OS A 406-2400	mixed flow		1,815 - 2,874		240 - 380	
ESP-OS A 406-3100	mixed flow		2,269 - 3,782		300 - 500	
ESP-OS A 406-3700	mixed flow		2,837 - 4,917		375 - 650	
ESP-OS A 406-5500	mixed flow		4,841 - 7,262		640 - 960	
ESP-OS A 449-5700	mixed flow	4.49 (114.0)	4,539 - 7,564	3,500	600 - 1,000	2,917
ESP-OS A 449-9400	mixed flow		7,186 - 11,725		950 - 1,550	
ESP-OS A 535-2500	mixed flow	5.35 (136.0)	1,600 - 3,200	3,500	212 - 423	2,917
ESP-OS A 535-3500	mixed flow		2,400 - 4,600		318 - 610	
ESP-OS A 535-4700	mixed flow		2,800 - 5,900		371 - 782	
ESP-OS A 535-7000	mixed flow		4,000 - 7,700		530 - 1,020	
ESP-OS A 535-7500	mixed flow		4,700 - 9,000		623 - 1,193	
ESP-OS A 535-10000	mixed flow		5,000 - 11,900		663 - 1,577	

ESP-OS A 272-900 HS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @4,000 RPM



TECHNICAL DATA

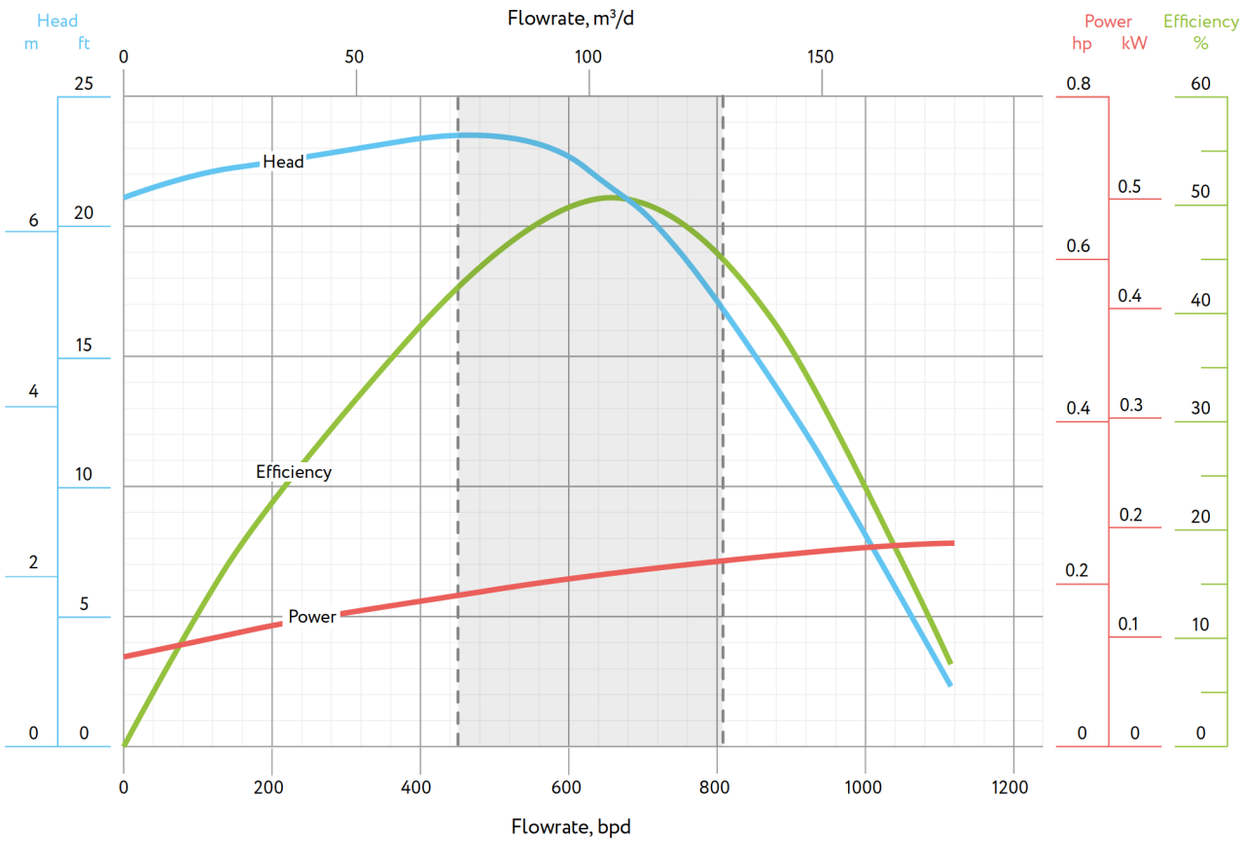
@4,000 RPM

Housing	outer diameter	2.72 in.	69 mm	Best efficiency		50%	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	629 bpd	100 m^3/d
Shaft	diameter	0.503 in.	12.8 mm		recommended operating range	432 - 778 bpd	69-124m^3/d
	shaft cross-sectional area	0.200 $In.^2$	128.68 mm^2	**Stage**	head	20.0 Ft	6.1 m
Shaft Limit	standard (direct start)	79 hp	59 kW		power	0.186 hp	0.138 kW
	high-strength (soft start)	100 hp	75 kW		rotational direction	CW	

ESP-OS A 272-900 HS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @4,160 RPM



TECHNICAL DATA

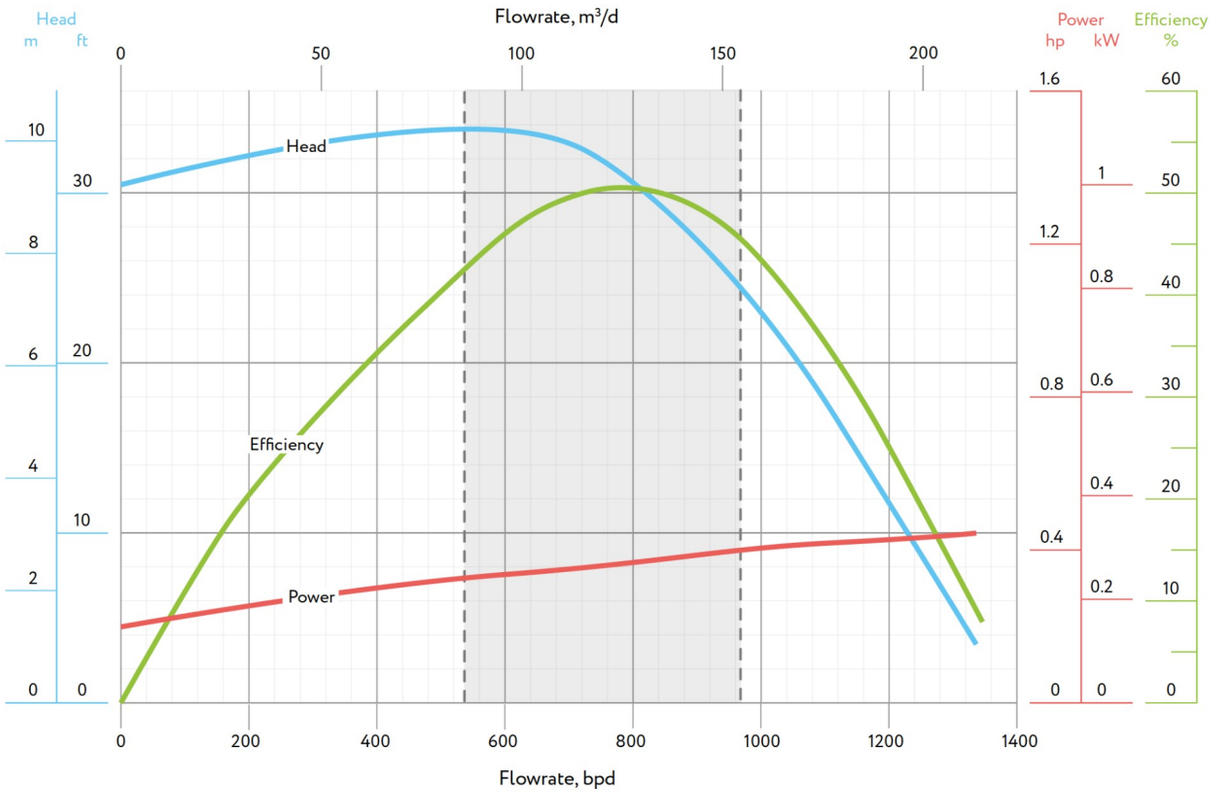
@4,160 RPM

Housing	outer diameter	2.72 in.	69 mm	Best efficiency		50%	
	housing pressure limit	6,000 psi	414 bar	Pump	optimum flow rate	656 bpd	104 m³/d
Shaft	diameter	0.503 in.	12.8 mm		recommended operating range	450-809 bpd	71-129 m³/d
	shaft cross-sectional area	0.200 in.²	128.68 mm²	Stage	head	21.6 ft	6.6 m
Shaft Limit	standard (direct start)	83 hp	61 kW		power	0.209 hp	0.156 kW
	high-strength (soft start)	104 hp	77 kW		rotational direction	CW	

ESP-OS A 272-900 HS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 4,990 RPM



TECHNICAL DATA

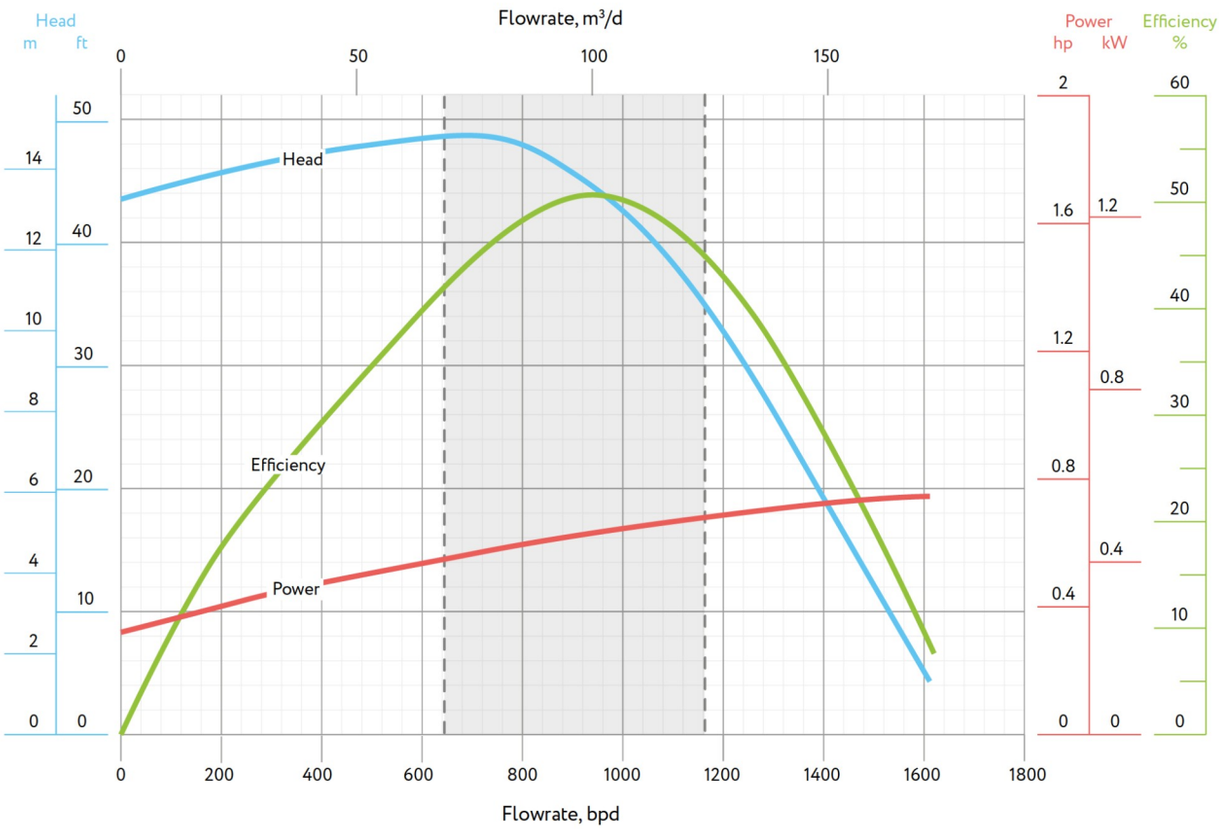
@4,990 RPM

Housing	outer diameter	2.72 in.	69 mm	Best efficiency		50%	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	787 bpd	125 m^3/d
Shaft	diameter	0.503 in.	12.8 mm		recommended operating range	539 - 971 bpd	86-154 m^3/d
	shaft cross-sectional area	0.200 $In.^2$	128.68 mm^2	**Stage**	head	31.1 Ft	9.5 m
Shaft Limit	standard (direct start)	99 hp	74 kW		power	0.360 hp	0.269 kW
	high-strength (soft start)	124 hp	93 kW		rotational direction	CW	

ESP-OS A 272-900 HS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 5,980 RPM



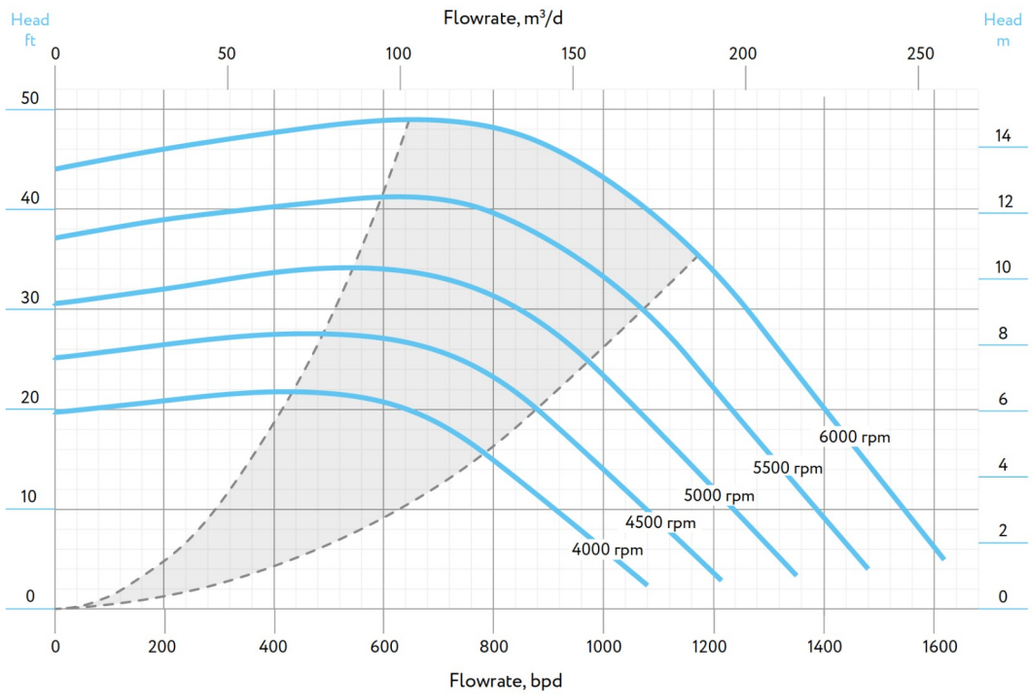
TECHNICAL DATA

@5,980 RPM

Housing	outer diameter	2.72 in.	69 mm	Best efficiency		50%	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	943 bpd	150 m^3/d
Shaft	diameter	0.503 in.	12.8 mm		recommended operating range	646 -1,163 bpd	103-185 m^3/d
	shaft cross-sectional area	0.200 $in.^2$	128.68 mm^2	**Stage**	head	44.6 Ft	13.6 m
Shaft Limit	standard (direct start)	119 hp	88 kW		power	0.620 hp	0.462 kW
	high-strength (soft start)	149 hp	111 kW		rotational direction	CW	

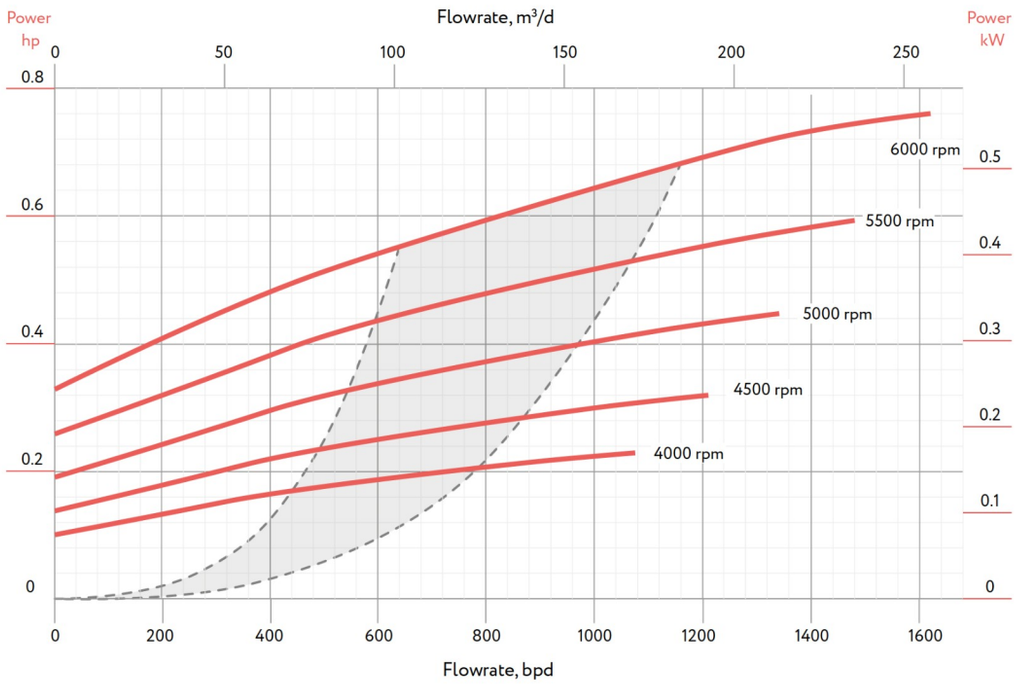
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



PACKET PUMPS

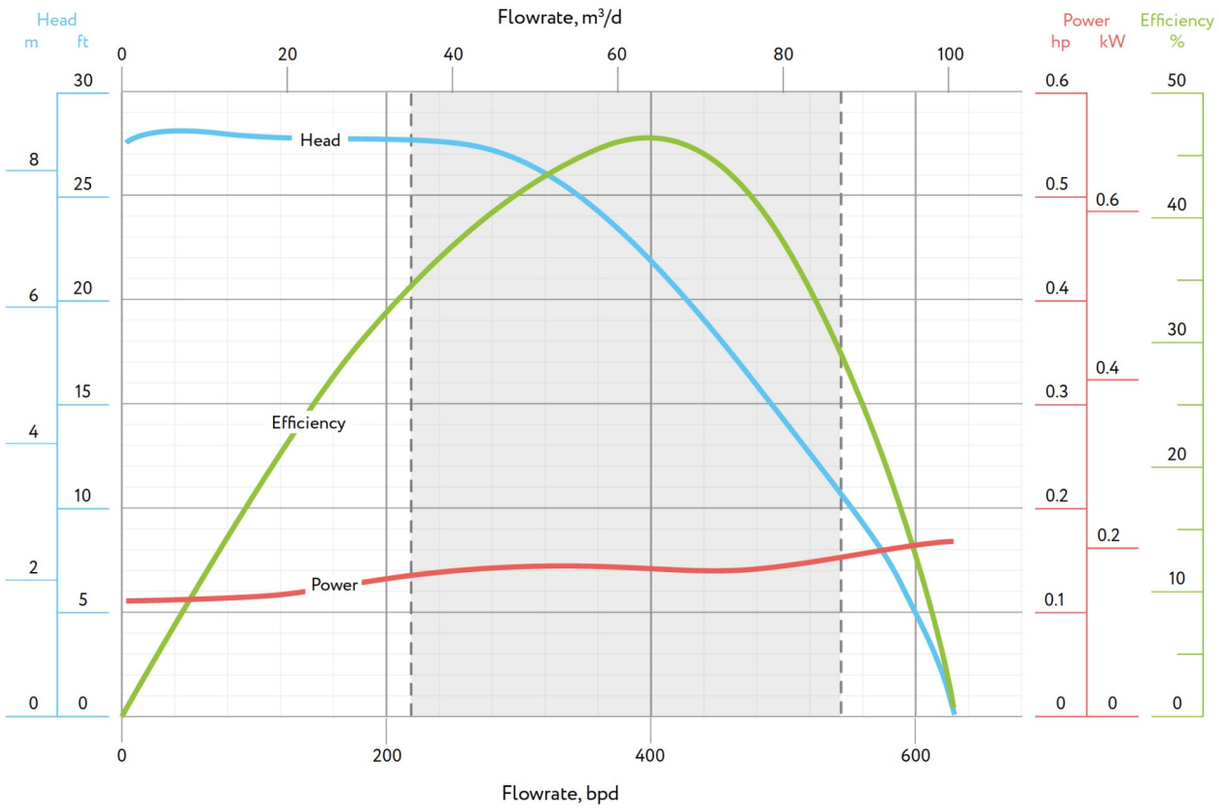
Housing	Abrasion Resistant Pump (TT3)	Type *	Length		Weight	
	stages		ft	m	lb	kg
3M	70	UT	10.6	3.220	152	69
		CT	10.5	3.202	152	69
3.5M	82	UT	12.2	3.720	179	81
		CT	12.1	3.702	179	81
4M	94	UT	13.8	4.220	203	92
		CT	13.8	4.202	203	92
4.5M	106	UT	15.5	4.720	229	104
		CT	15.4	4.702	229	104
5M	118	UT	17.1	5.220	254	115
		CT	17.1	5.202	254	115

*** UT – Upper Tandem; CT – Center Tandem**

ESP-OS A 319-550 HS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 4,050 RPM



TECHNICAL DATA

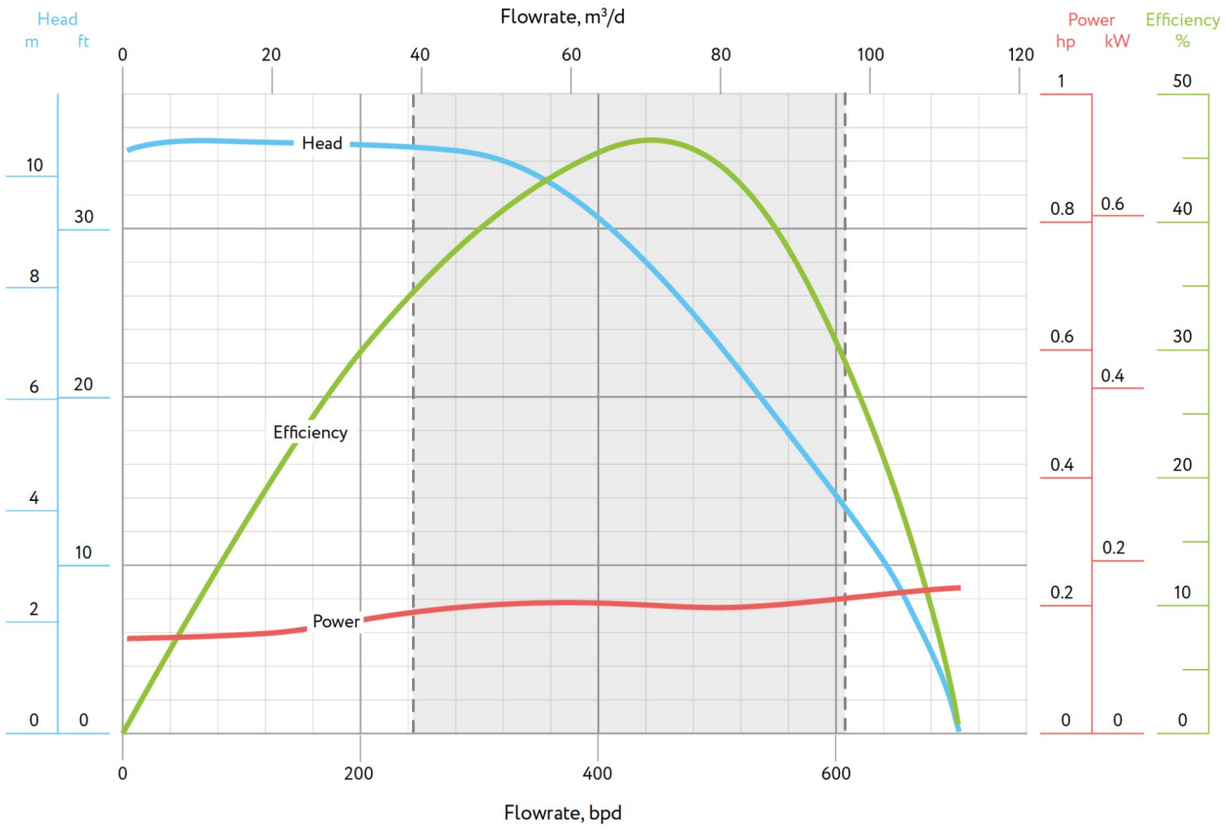
@ 4,050 RPM

Housing	outer diameter	3.19 in.	81 mm	Best efficiency		46%	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	400 bpd	64 m^3/d
Shaft	diameter	0.551 in.	14.0 mm		recommended operating range	219-546 bpd	35 - 92 m^3/d
	shaft cross-sectional area	0.239 $in.^2$	153.94 mm^2	**Stage**	head	21.8 Ft	6.6 m
Shaft Limit	standard (direct start)	84 hp	63 kW		power	0.140 hp	0.104 kW
	high-strength (soft start)	157 hp	117 kW		rotational direction	CW	

ESP-OS A 319-550 HS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 4,530 RPM



TECHNICAL DATA

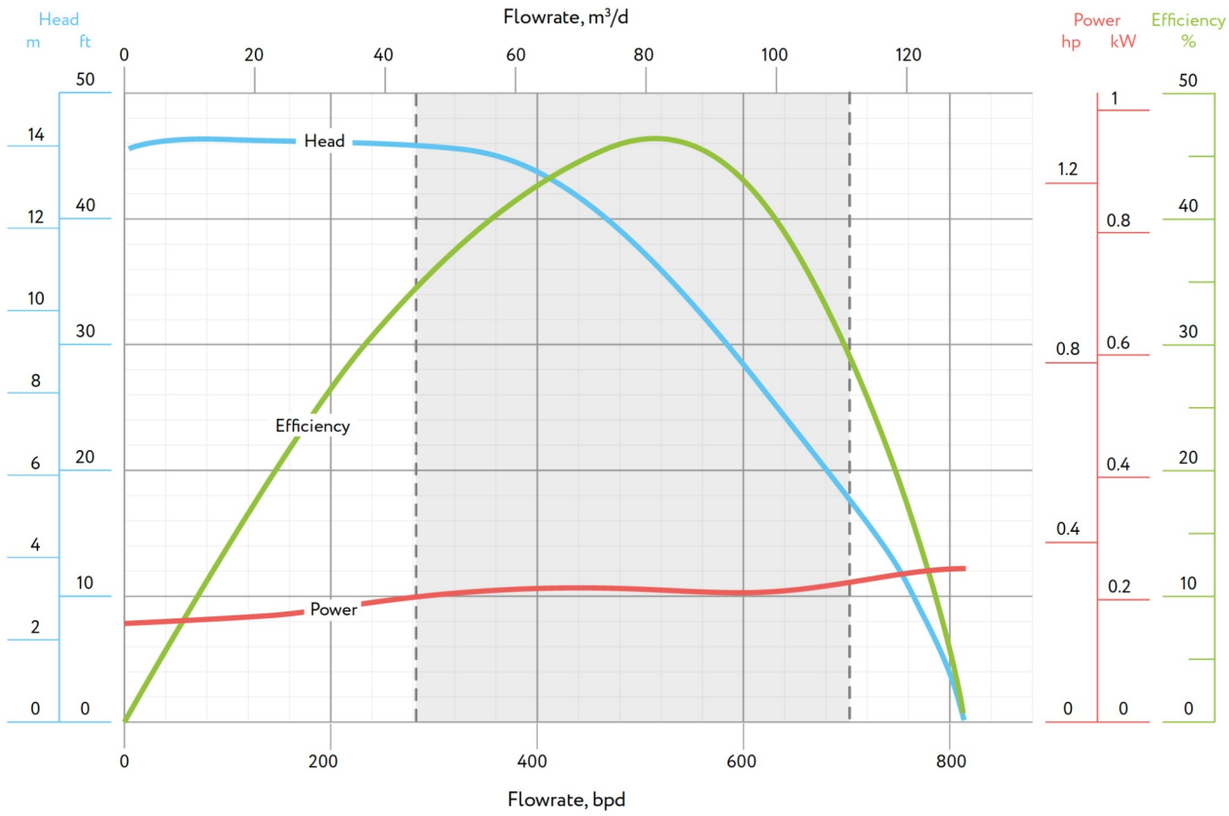
@ 4,530 RPM

Housing	outer diameter	3.19 in.	81 mm	Best efficiency		46%	
	housing pressure limit	6,000 psi	414 bar	Pump	optimum flow rate	448 bpd	71 m^3/d
Shaft	diameter	0.551 in.	14.0 mm		recommended operating range	245-611 bpd	39-97 m^3/d
	shaft cross-sectional area	0.239 $in.^2$	'53.94 mm^2	Stage	head	27.3 ft	8.3 m
Shaft Limit	standard (direct start)	94 hp	70 kW		power	0.196 hp	0.146 kW
	high-strength (soft start)	176 hp	131 kW		rotational direction	CW	

ESP-OS A 319-550 HS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 5,170 RPM



TECHNICAL DATA

@ 5,170 RPM

Housing	outer diameter	3.19 in.	81 mm	Best efficiency		46%	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	511 bpd	81 m^3/d
Shaft	diameter	0.551 in.	14.0 mm		recommended operating range	279 - 697 bpd	44-111 m^3/d
	shaft cross-sectional area	0.239 in^2	153.94 mm^2	**Stage**	head	35.5 Ft	10.8 m
Shaft Limit	standard (direct start)	107 hp	80 kW		power	0.292 hp	0.217 kW
	high-strength (soft start)	200 hp	149 kW		rotational direction	CW	

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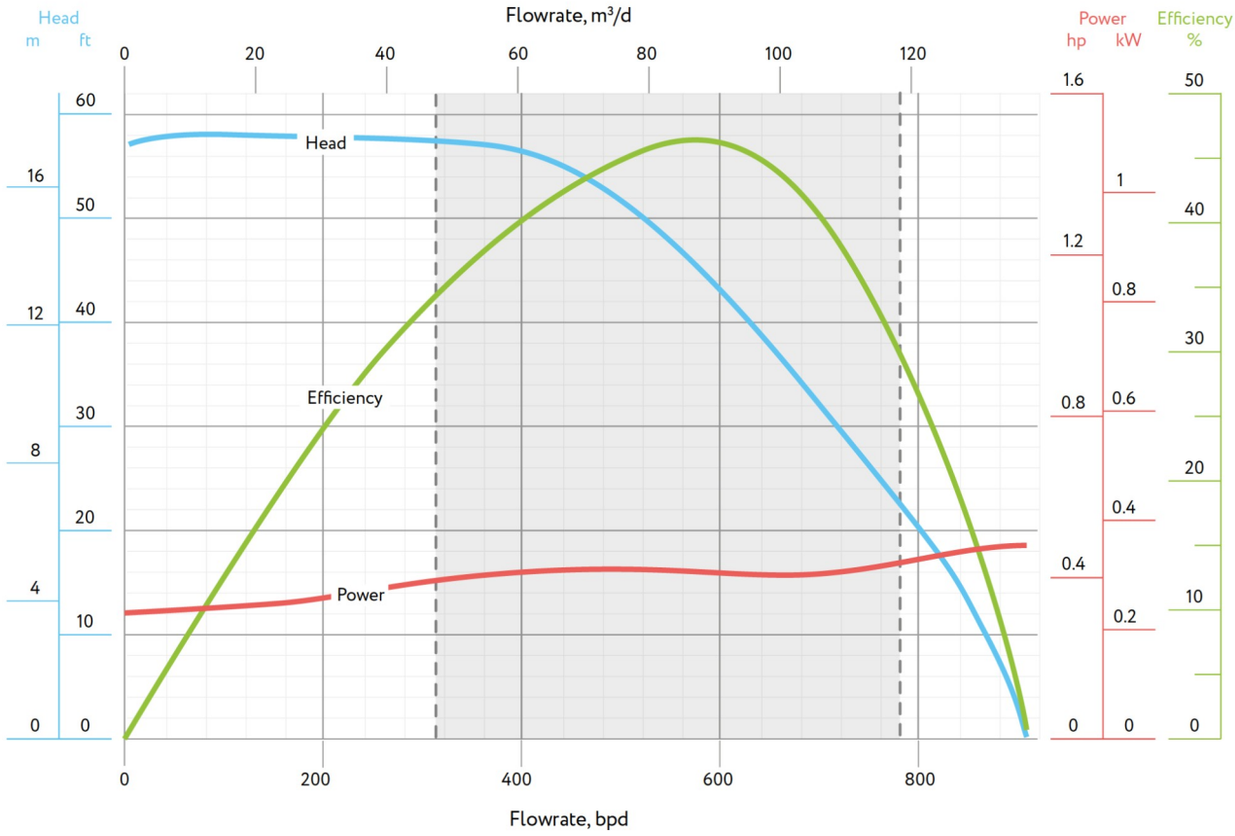
ESP-OS A 319-550 HS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 5,820 RPM



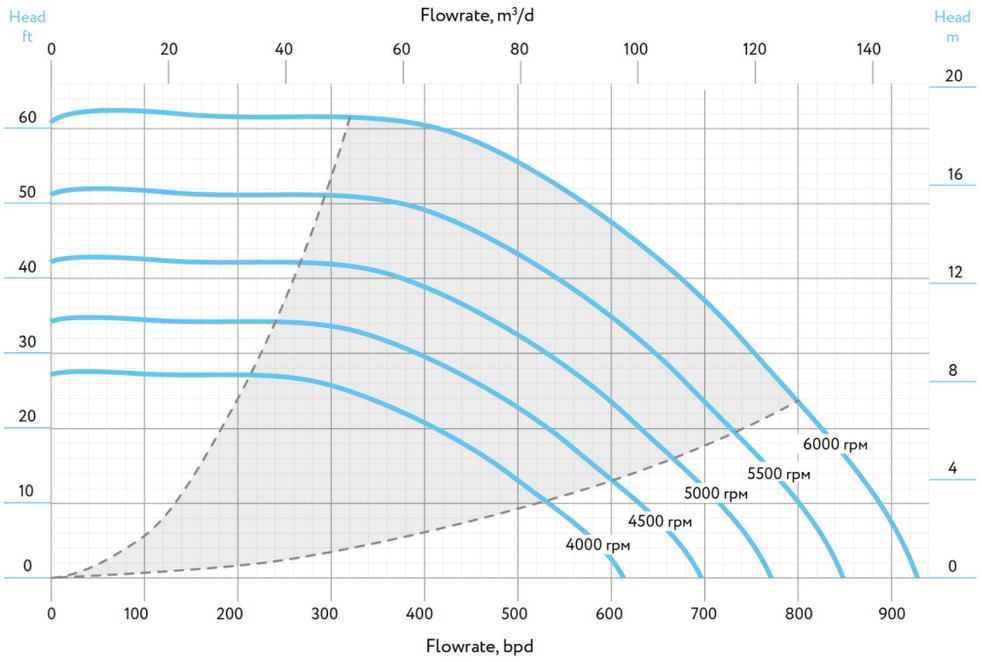
TECHNICAL DATA

@ 5,820 RPM

Housing	outer diameter	3.19 in.	81 mm	Best efficiency		46%	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	575 bpd	91 m^3/d
Shaft	diameter	0.551 in.	14.0 mm		recommended operating range	314-786 bpd	50-125 m^3/d
	shaft cross-sectional area	0.239 in^2	153.94 mm^2	**Stage**	head	45.0 Ft	13.7 m
Shaft Limit	standard (direct start)	121 hp	90 kW		power	0.416 hp	0.310 kW
	high-strength (soft start)	226 hp	168 kW		rotational direction	CW	

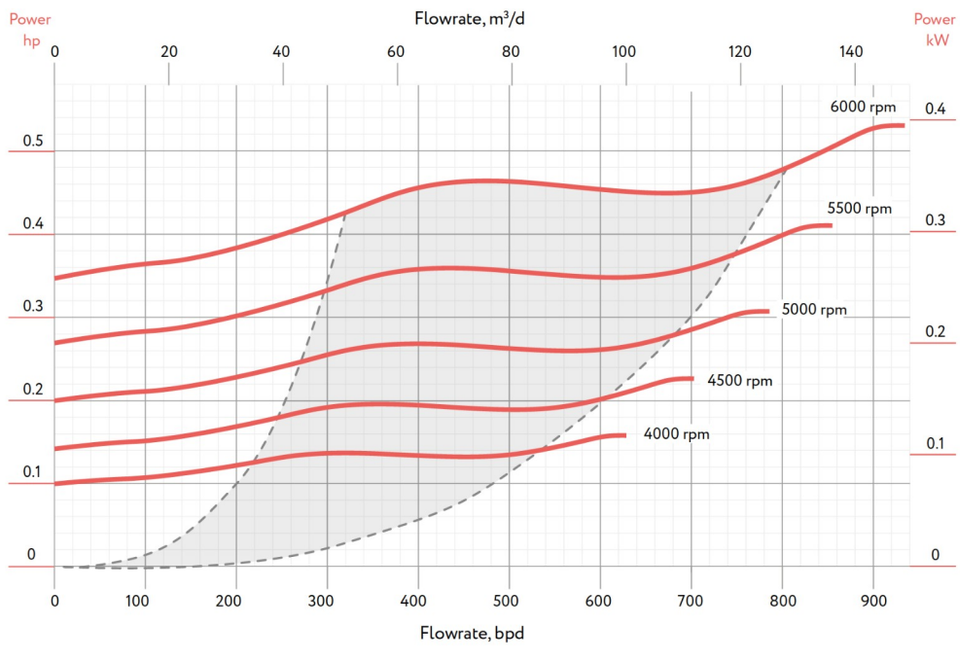
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



COMPRESSION PUMPS

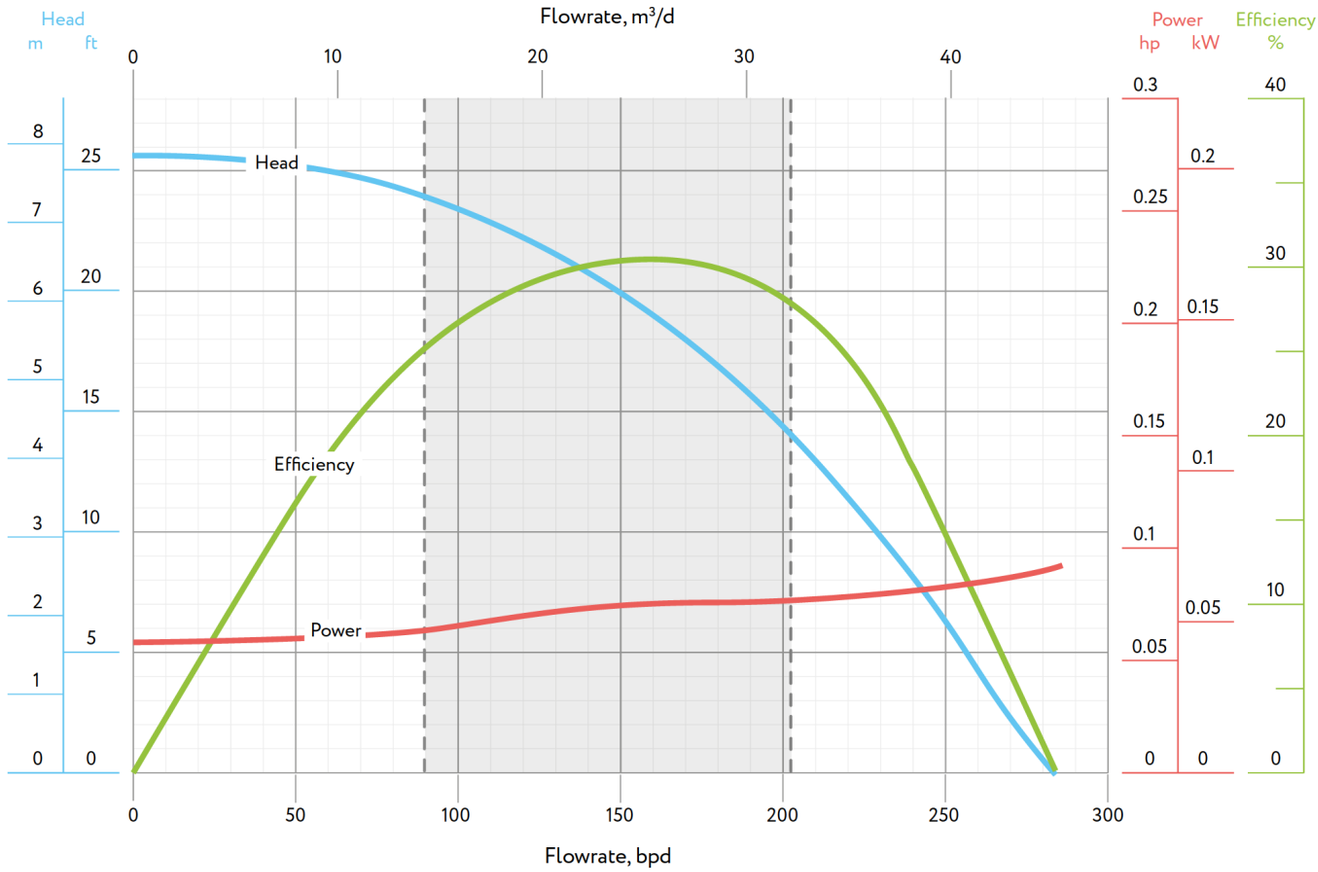
Housing	Abrasion Resistant Pump (TT3)	Type *	Length		Weight	
	stages		ft	m	lb	kg
1M	30	UT	4.1	1.243	75	34
		CT	3.9	1.202	75	34
1.5M	46	UT	5.7	1.743	101	46
		CT	5.6	1.702	101	46
2M	62	UT	7.4	2.243	128	58
		CT	7.2	2.202	128	58
2.5M	78	UT	9.0	2.743	154	70
		CT	8.9	2.702	154	70

*** UT – Upper Tandem; CT – Center Tandem**

ESP-OS A 338-150

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

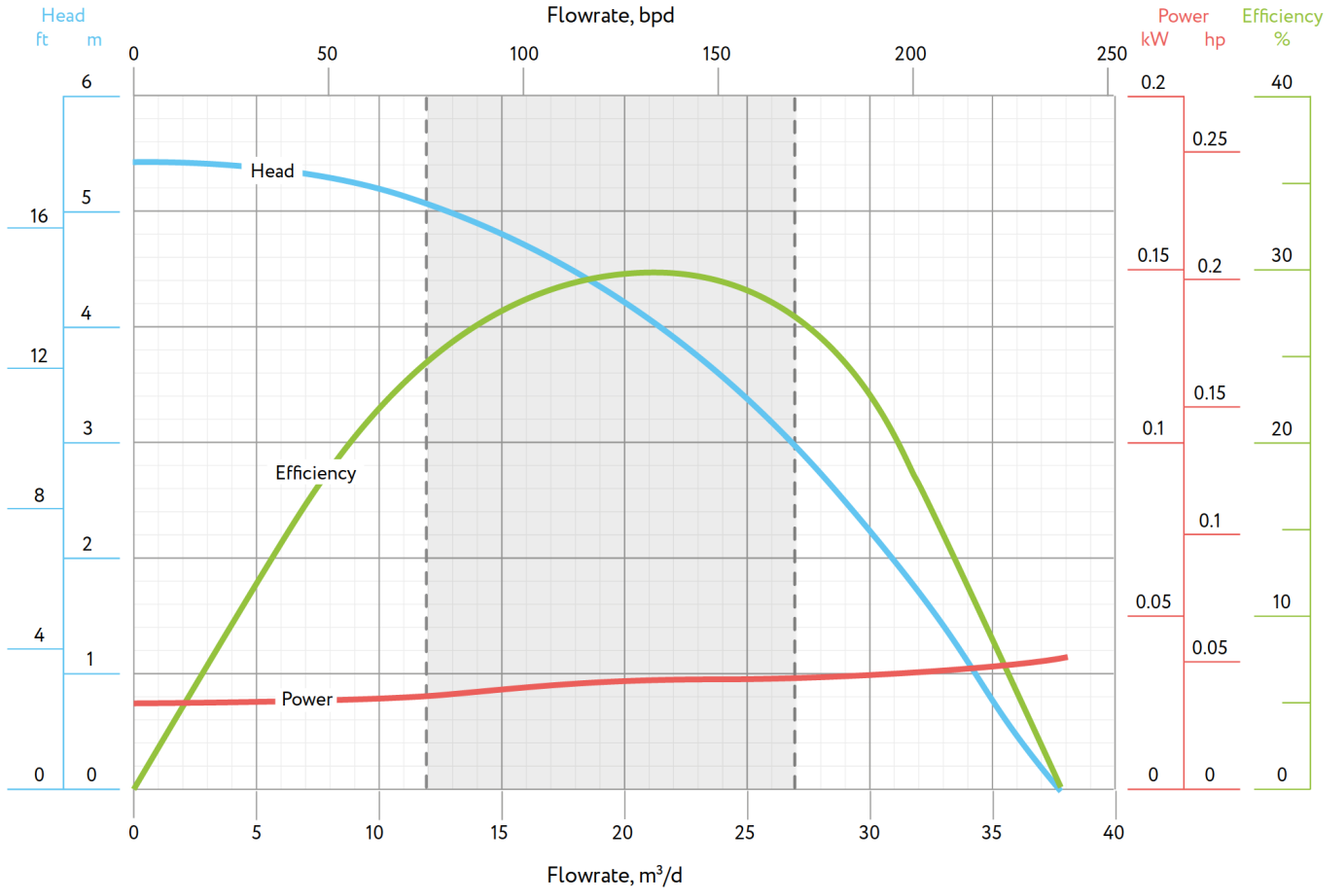
60 HZ-3,500 RPM

Housing	outer diameter	3.38 in.	86 mm	Best efficiency		30%	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	163 bpd	26 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	91 - 204 bpd	14 - 32 m^3/d
	shaft cross-sectional area	0.352 in^2	226.98 mm^2	**Stage**	head	18.8 Ft	5.7 m
Shaft Limit	standard (direct start)	129 hp	96 kW		power	0.075 hp	0.056 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

338 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



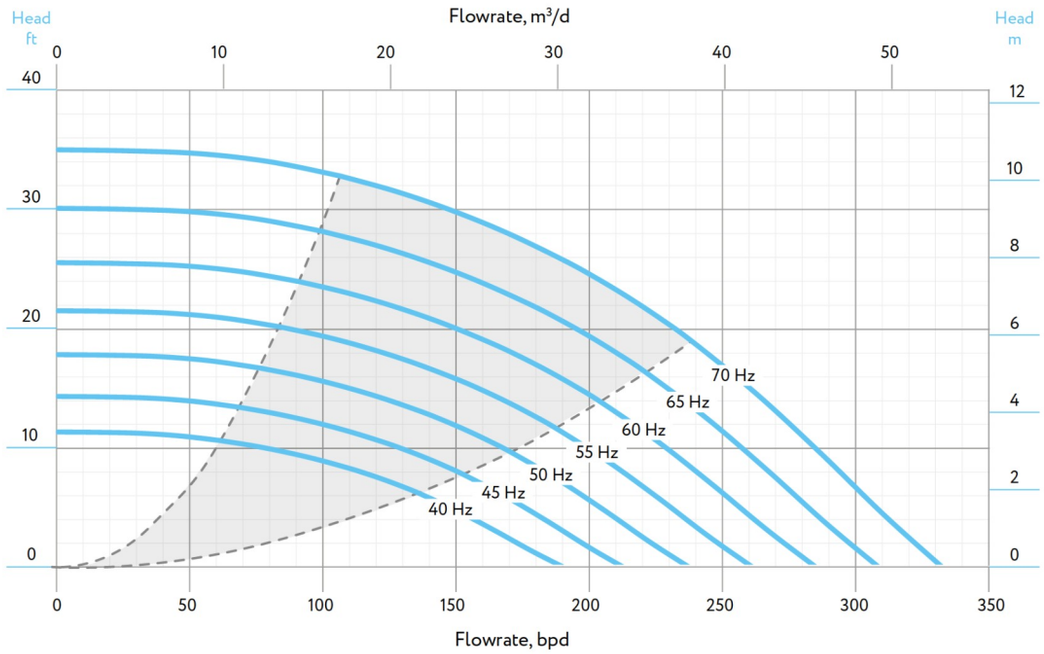
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.38 in.	86 mm	Best efficiency		30%	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	138 bpd	22 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	75-170 bpd	12-27 m^3/d
	shaft cross-sectional area	0.352 in^2	226.98 mm^2	**Stage**	head	13.1 Ft	4.0 m
Shaft Limit	standard (direct start)	107 hp	80 kW		power	0.043 hp	0.032 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

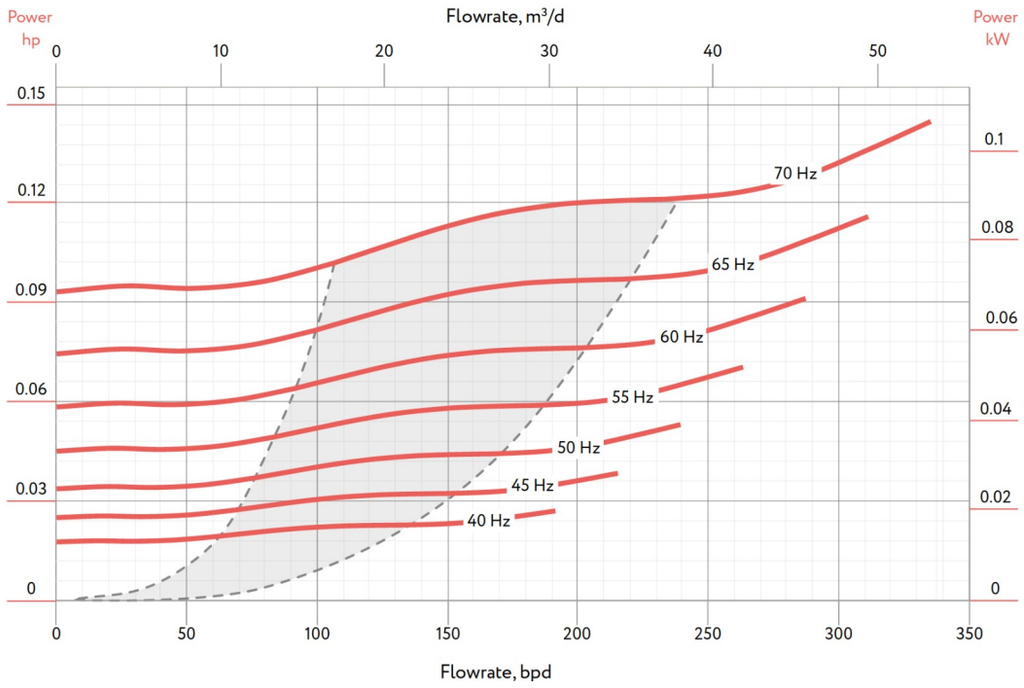
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



338 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	27	3.9	1.202	117	53
2M	64	7.2	2.202	201	91

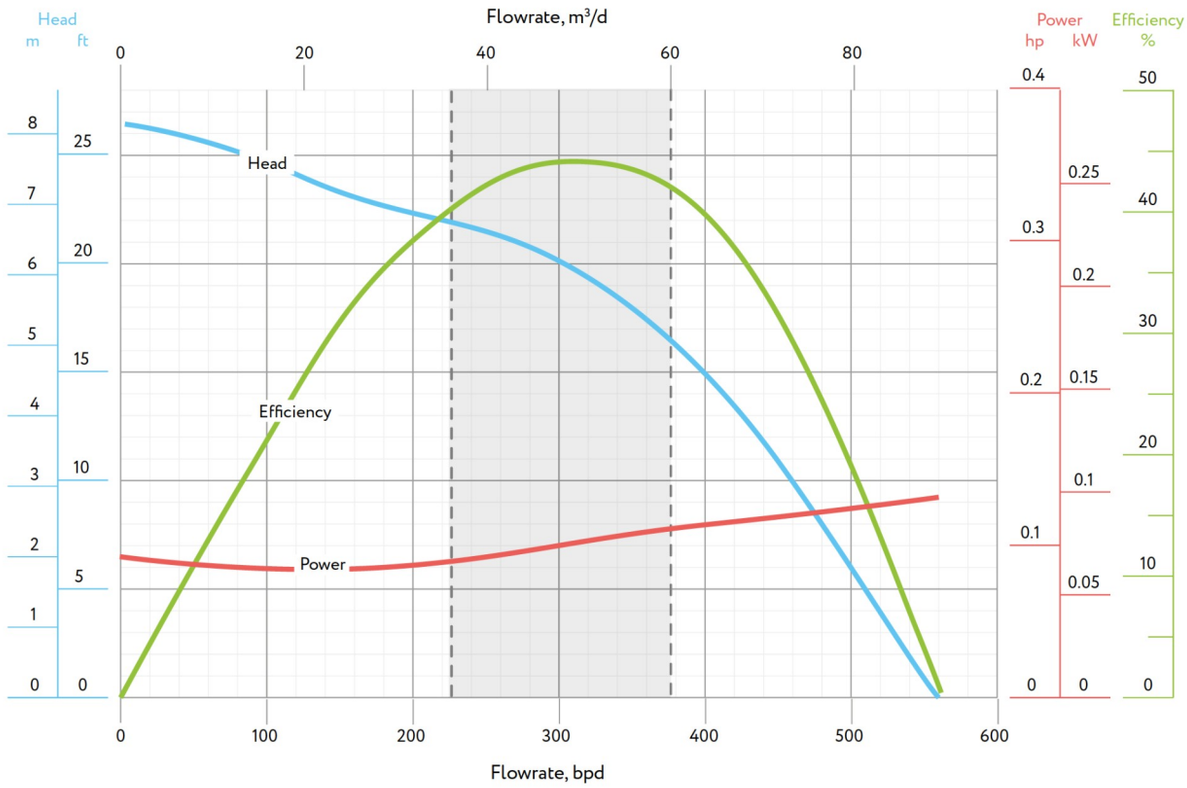
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	115	10.5	3.202	239	109
3.5M	135	12.1	3.702	275	125
4M	154	13.8	4.202	310	141
4.5M	174	15.4	4.702	345	157
5M	193	17.1	5.202	380	173
5.5M	213	18.7	5.702	416	189

ESP-OS A 338-300

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

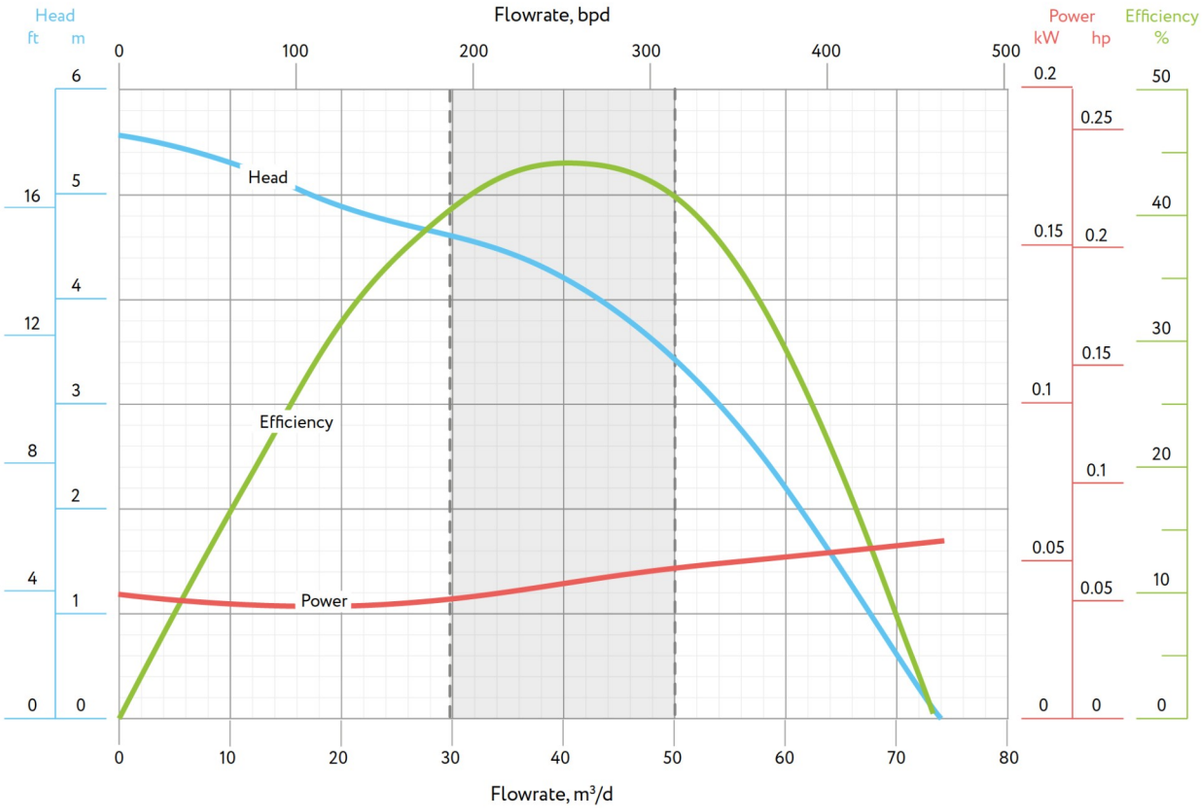
60 HZ-3,500 RPM

Housing	outer diameter	3.38 in.	86 mm	Best efficiency		44 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	315 bpd	50 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	212 - 393 bpd	34 - 62 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	19.7 ft	6.0 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.104 hp	0.077 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

338 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



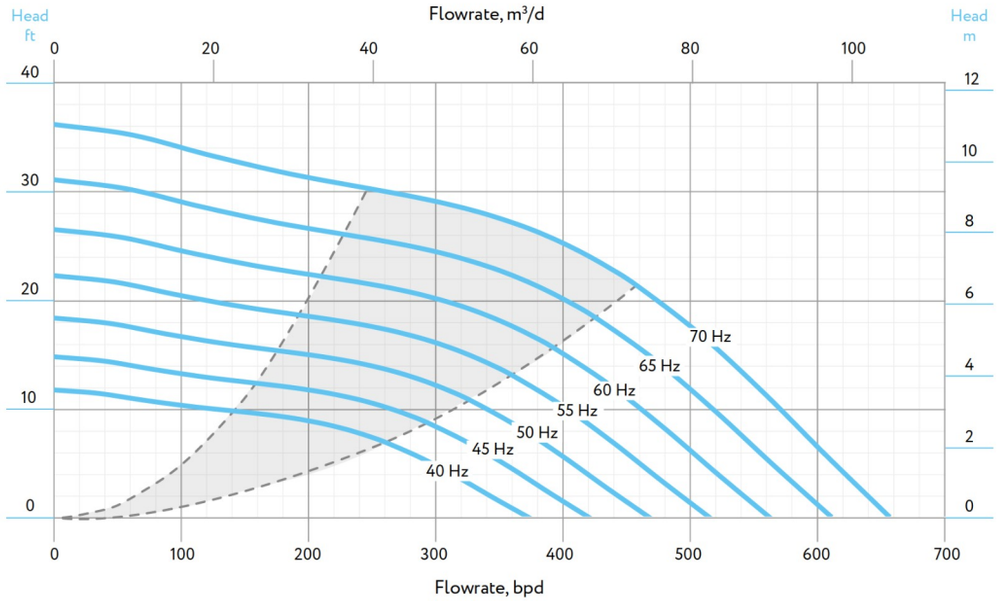
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.38 in.	86 mm	Best efficiency		44 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	264 bpd	42 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	176 - 327 bpd	28 - 52 m^3/d
	shaft cross-sectional area	0.352 in^2	226.98 mm^2	**Stage**	head	13.8 ft	4.2 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.060 hp	0.045 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

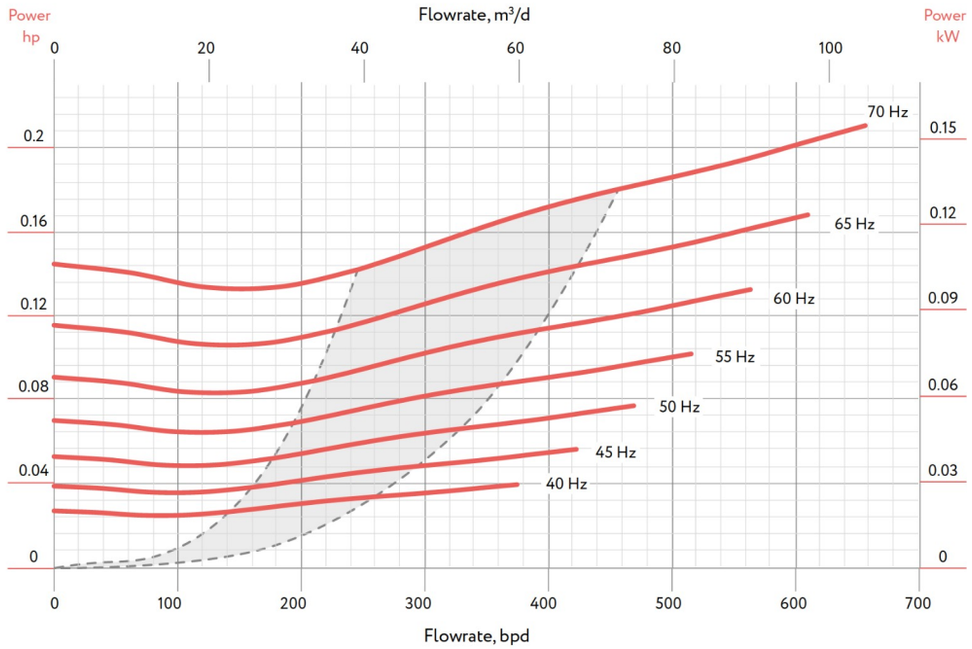
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	24	3.9	1.202	128	58
2M	53	7.2	2.202	209	95
2.5M	69	8.9	2.702	256	116

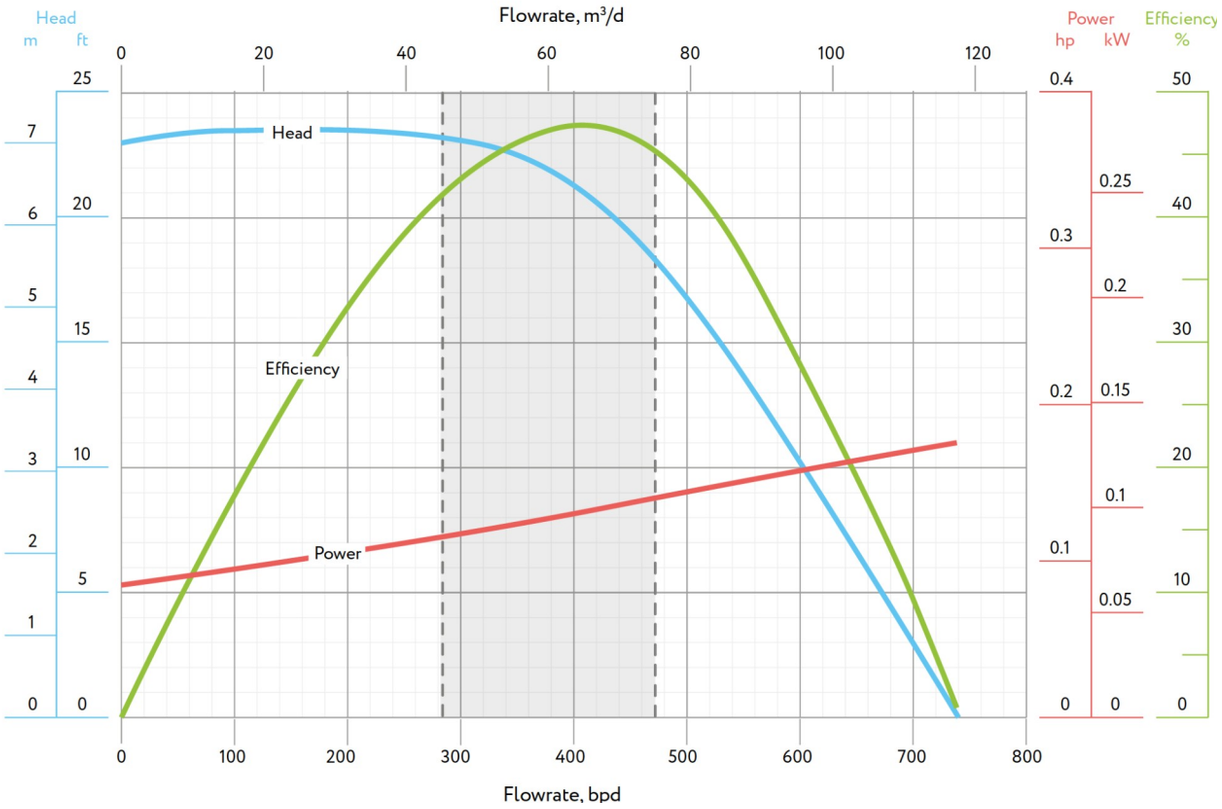
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	94	10.5	3.202	240	109
3.5M	109	12.1	3.702	276	125
4M	125	13.8	4.202	311	141
4.5M	141	15.4	4.702	346	157
5M	157	17.1	5.202	381	173
5.5M	172	18.7	5.702	417	189

ESP-OS A 338-400

PUMP PERFORMANCE CURVE

11 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

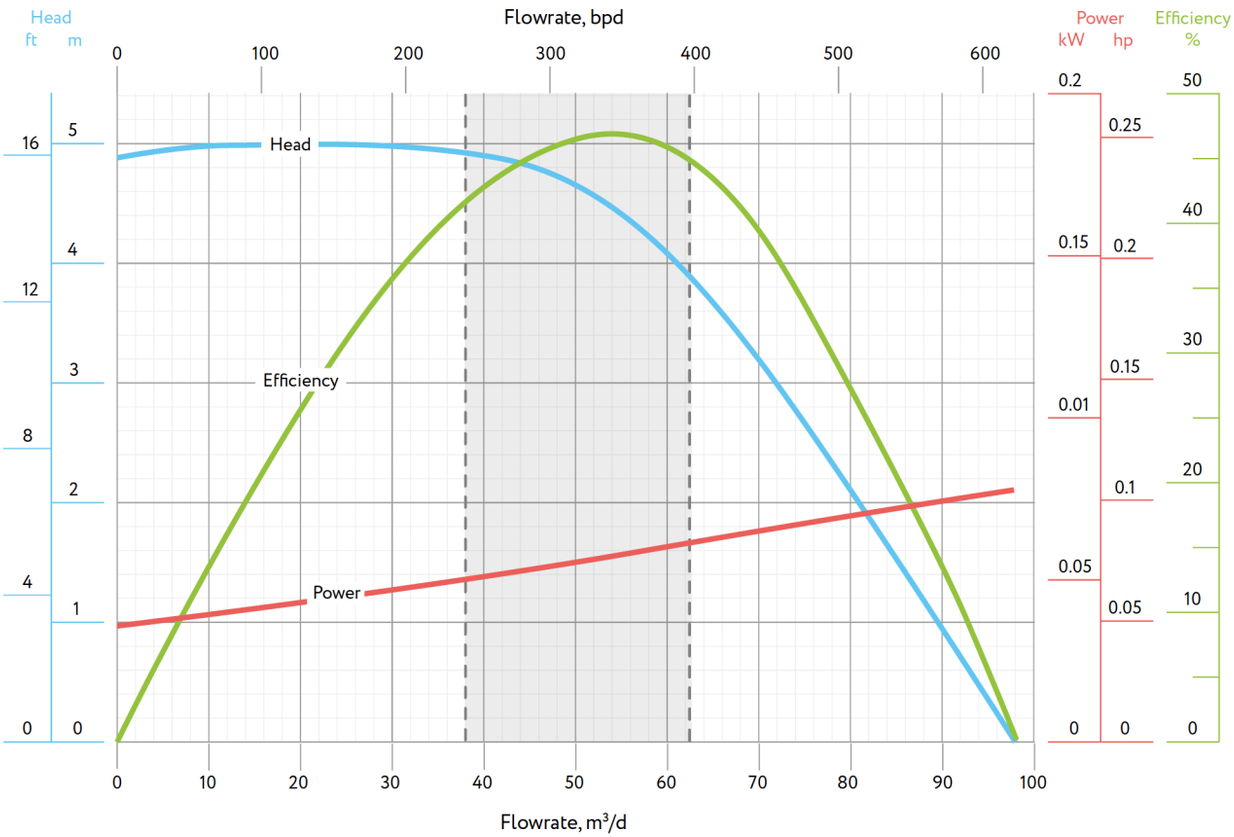
60 HZ-3,500 RPM

Housing	outer diameter	3.38 in.	86 mm	Best efficiency		47 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	398 bpd	63 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	284 – 473 bpd	45 - 75 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	21.3 ft	6.5 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.133 hp	0.099 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

338 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



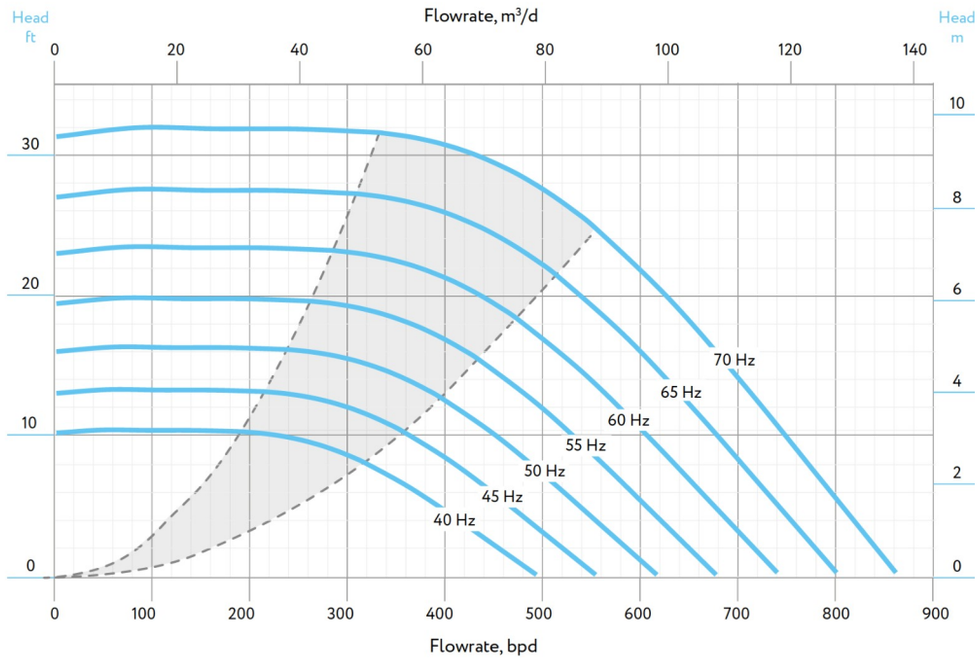
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.38 in.	86 mm	Best efficiency		47 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	333 bpd	53 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	236 - 393 bpd	38 - 63 m3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	14.8 ft	4.5 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.0765 hp	0.057 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

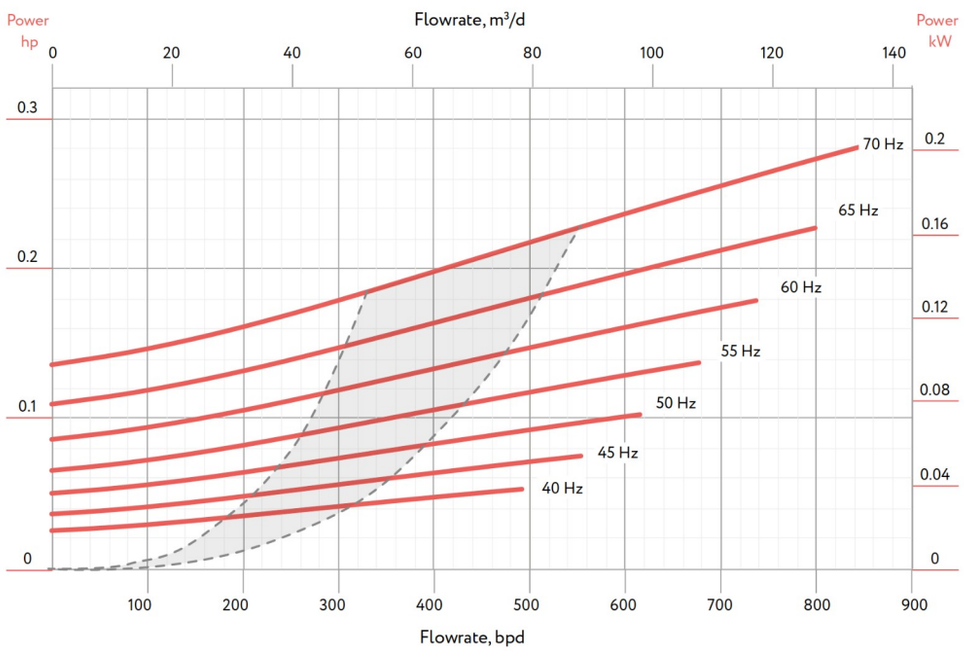
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



338 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	24	3.9	1.202	128	58
2M	52	7.2	2.202	209	95
2.5M	68	8.9	2.702	256	116

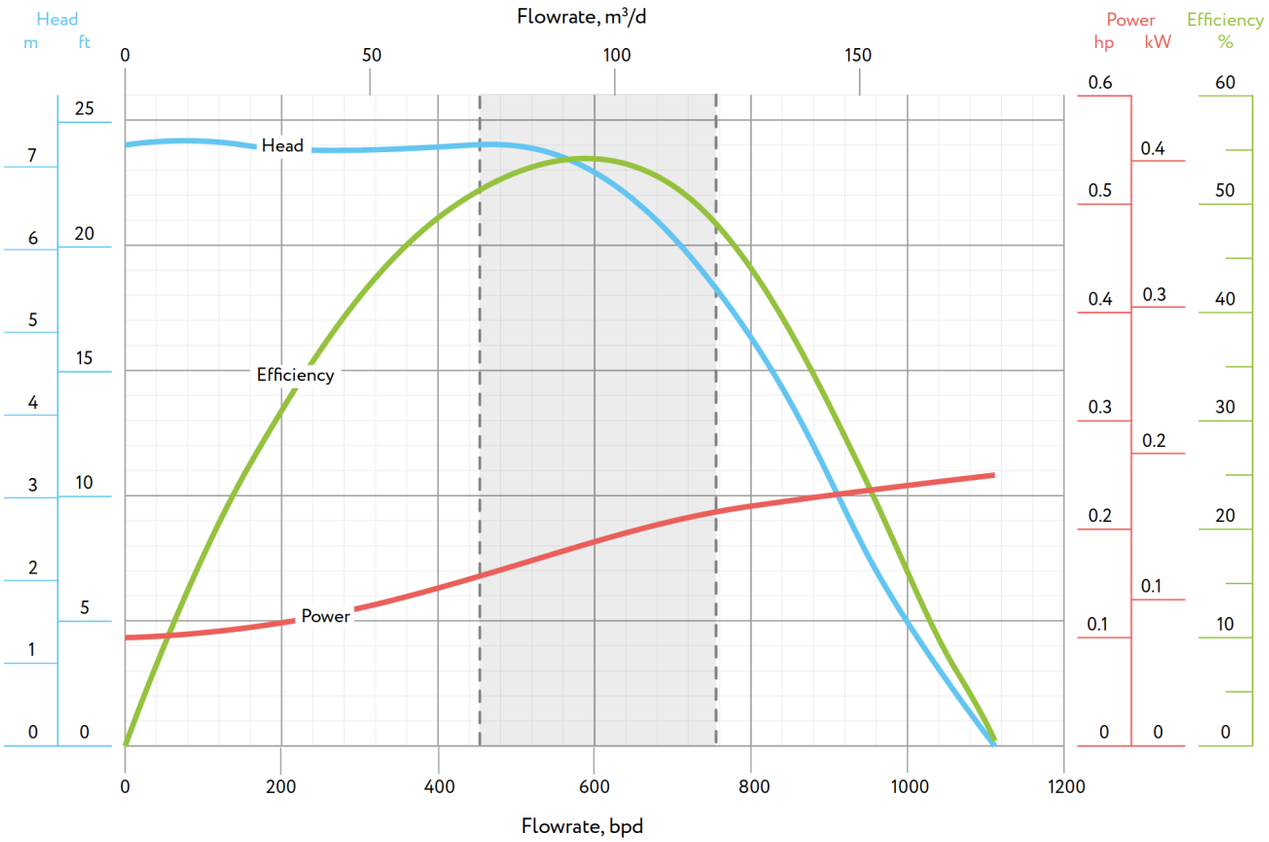
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	89	10.5	3.202	240	109
3.5M	105	12.1	3.702	276	125
4M	120	13.8	4.202	311	141
4.5M	136	15.4	4.702	346	157
5M	151	17.1	5.202	381	173
5.5M	166	18.7	5.702	417	189

ESP-OS A 338-550

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

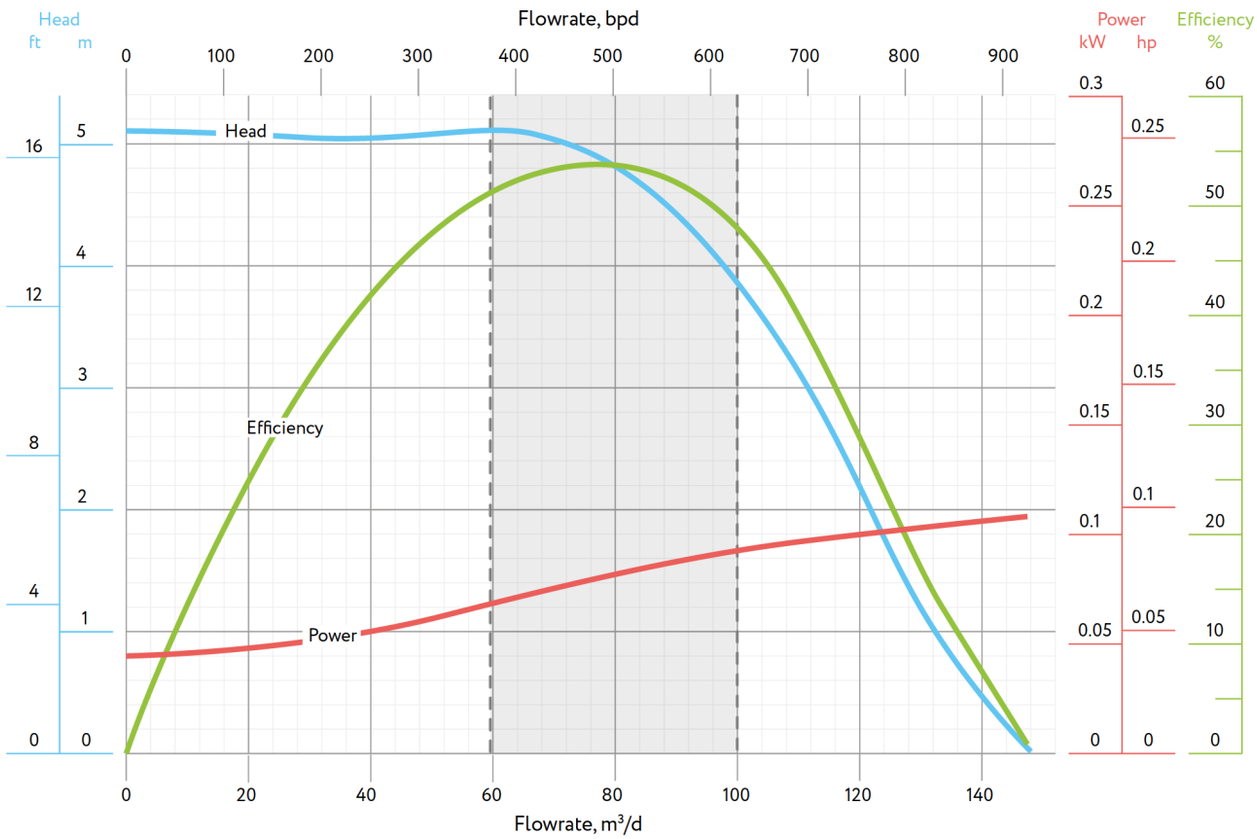
60 HZ-3,500 RPM

Housing	outer diameter	3.38 in.	86 mm	Best efficiency		54 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	587 bpd	63 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	454 - 756 bpd	72 - 120 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	23.1 ft	7.0 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.185 hp	0.138 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

338 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



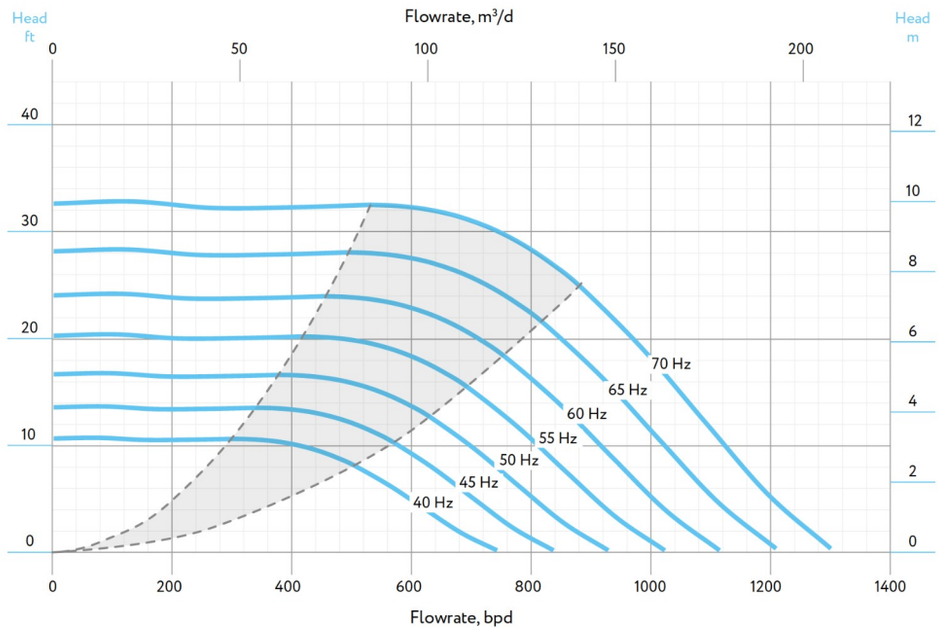
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.38 in.	86 mm	Best efficiency		54 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	491 bpd	78 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	377 - 629 bpd	60 - 100 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	16.1 ft	4.9 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.107 hp	0.080 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

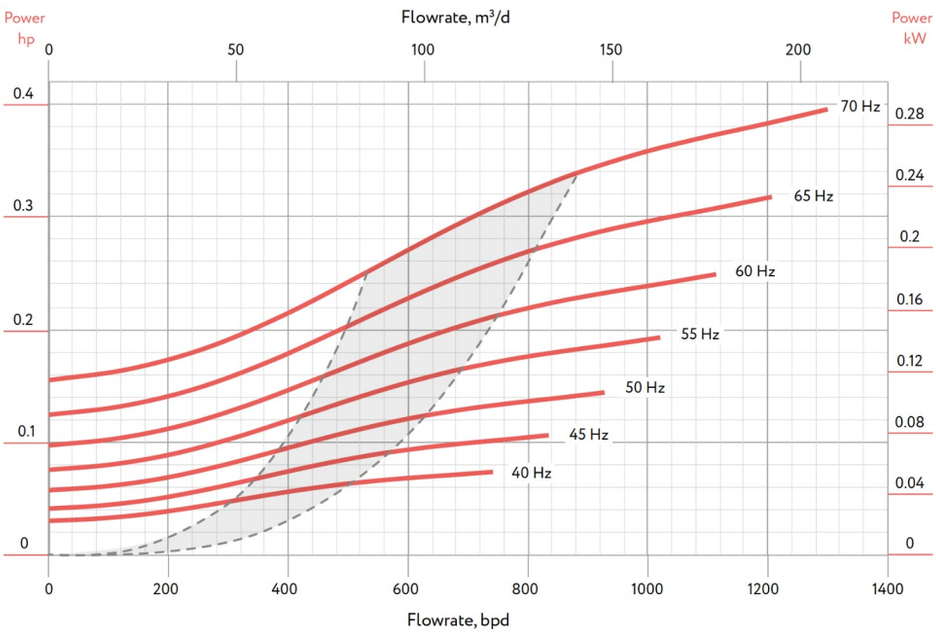
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



338 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	24	3.9	1.202	128	58
2M	52	7.2	2.202	209	95
2.5M	68	8.9	2.702	256	116

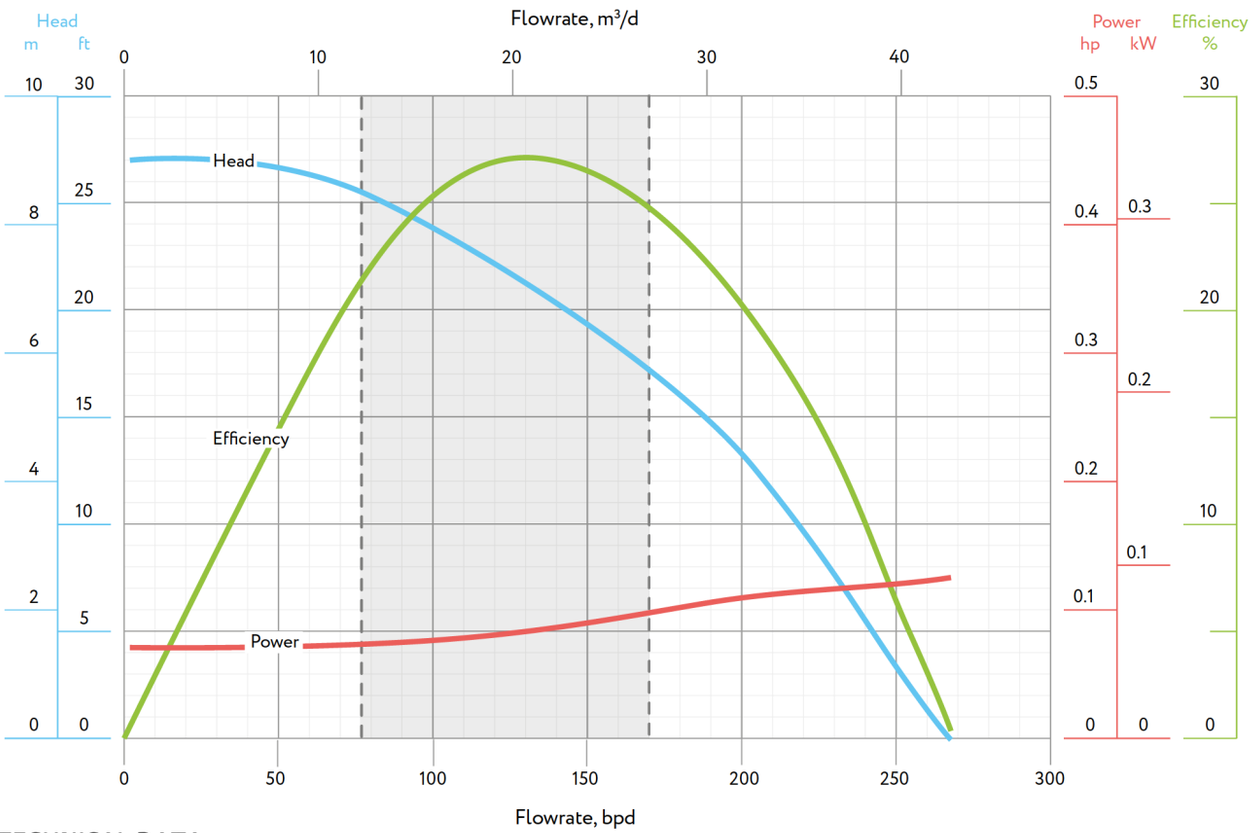
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	89	10.5	3.202	240	109
3.5M	105	12.1	3.702	276	125
4M	120	13.8	4.202	311	141
4.5M	136	15.4	4.702	346	157
5M	151	17.1	5.202	381	173
5.5M	166	18.7	5.702	417	189

ESP-OS A 362-130

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

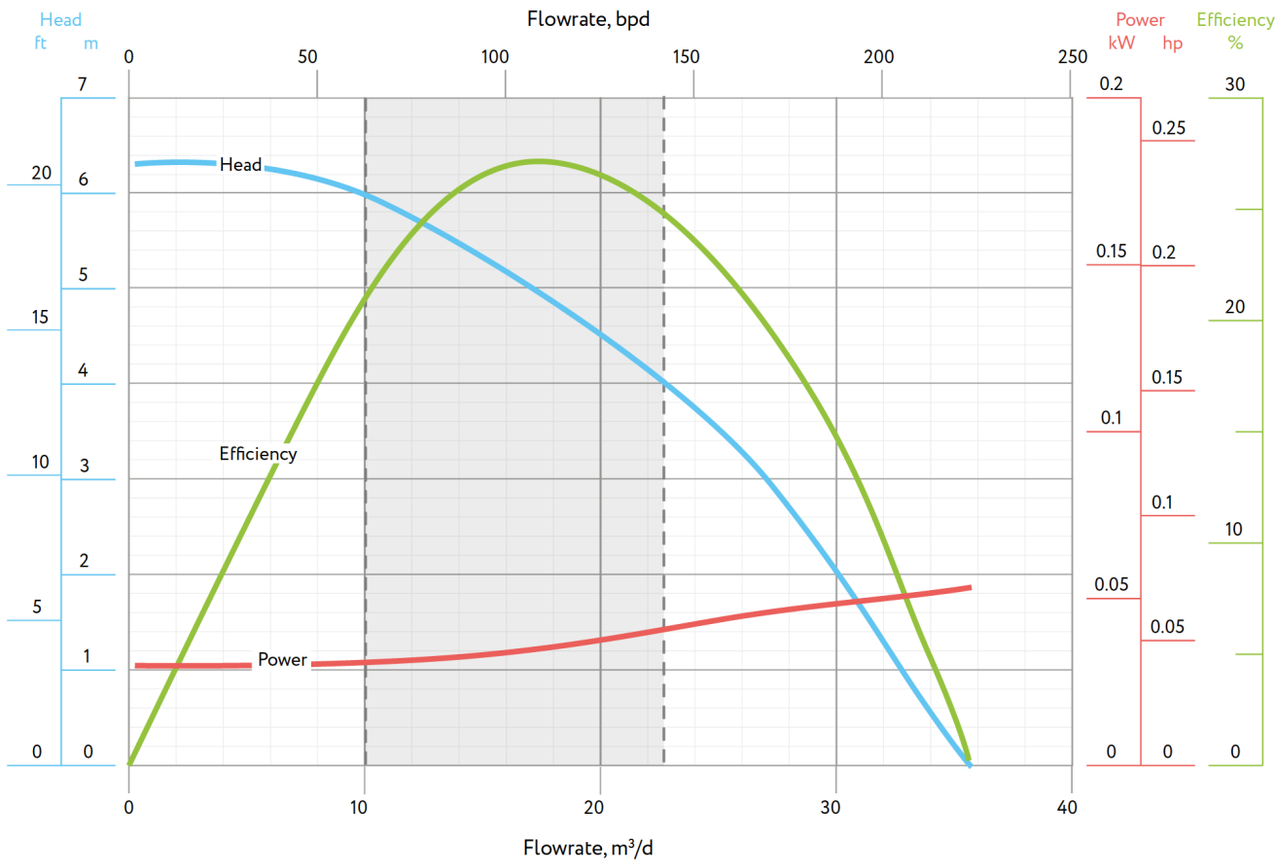
60 HZ-3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		27 %	
	housing pressure limit	6,000 psi	465bar	**Pump**	optimum flow rate	130 bpd	21 m^3/d
Shaft	diameter	0.669 in.	17.0mm		recommended operating range	76 - 170 bpd	12 - 27 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	23.5 ft	7.2 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.083 hp	0.062 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



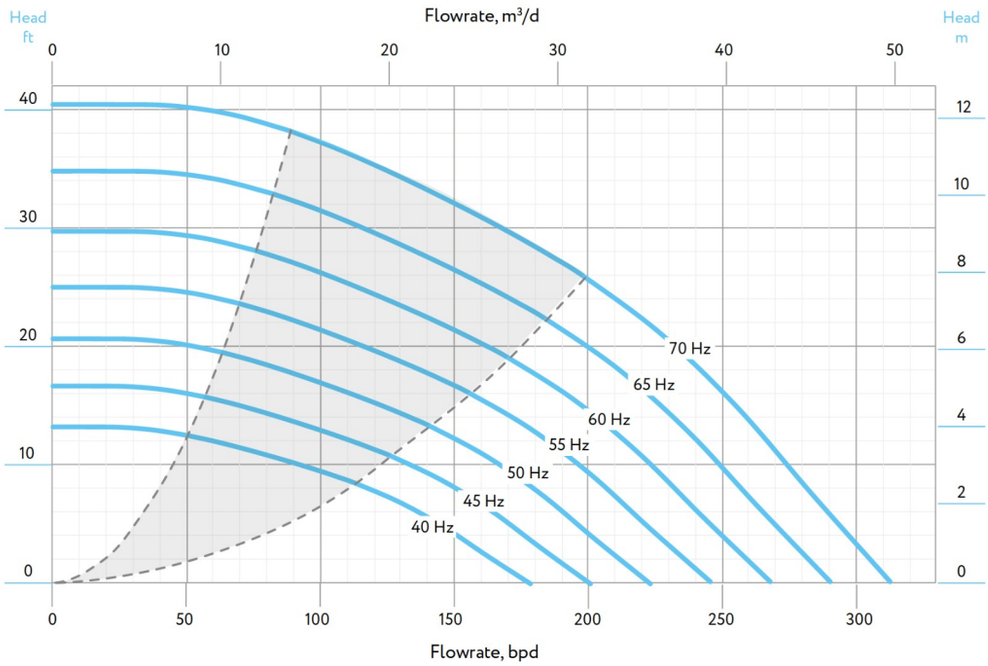
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		27 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	107 bpd	17 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	63 - 142 bpd	10 - 23 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	16.4 ft	5.0 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.048 hp	0.036 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

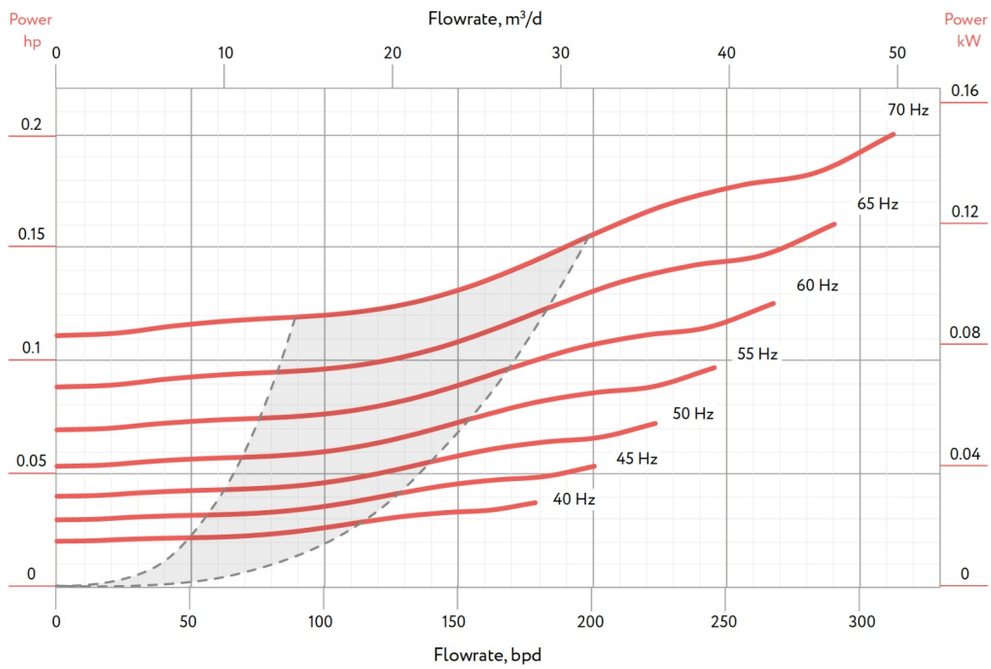
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



362 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	34	3.9	1.202	132	60
2M	74	7.2	2.202	214	97

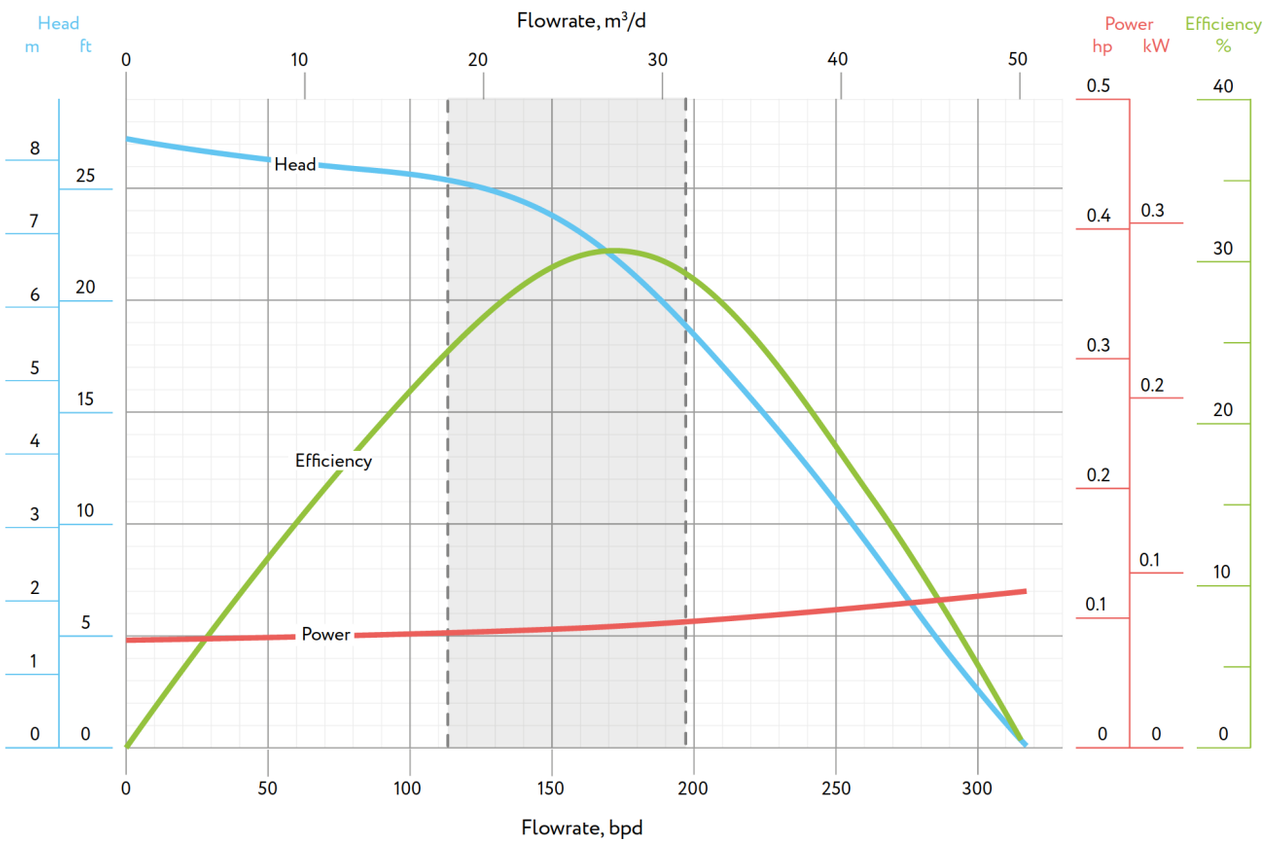
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	116	10.5	3.202	262	119
3.5M	135	12.1	3.702	297	135
4M	155	13.8	4.202	333	151
4.5M	175	15.4	4.702	368	167
5M	195	17.1	5.202	403	183
5.5M	215	18.7	5.702	438	199

ESP-OS A 362-170

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

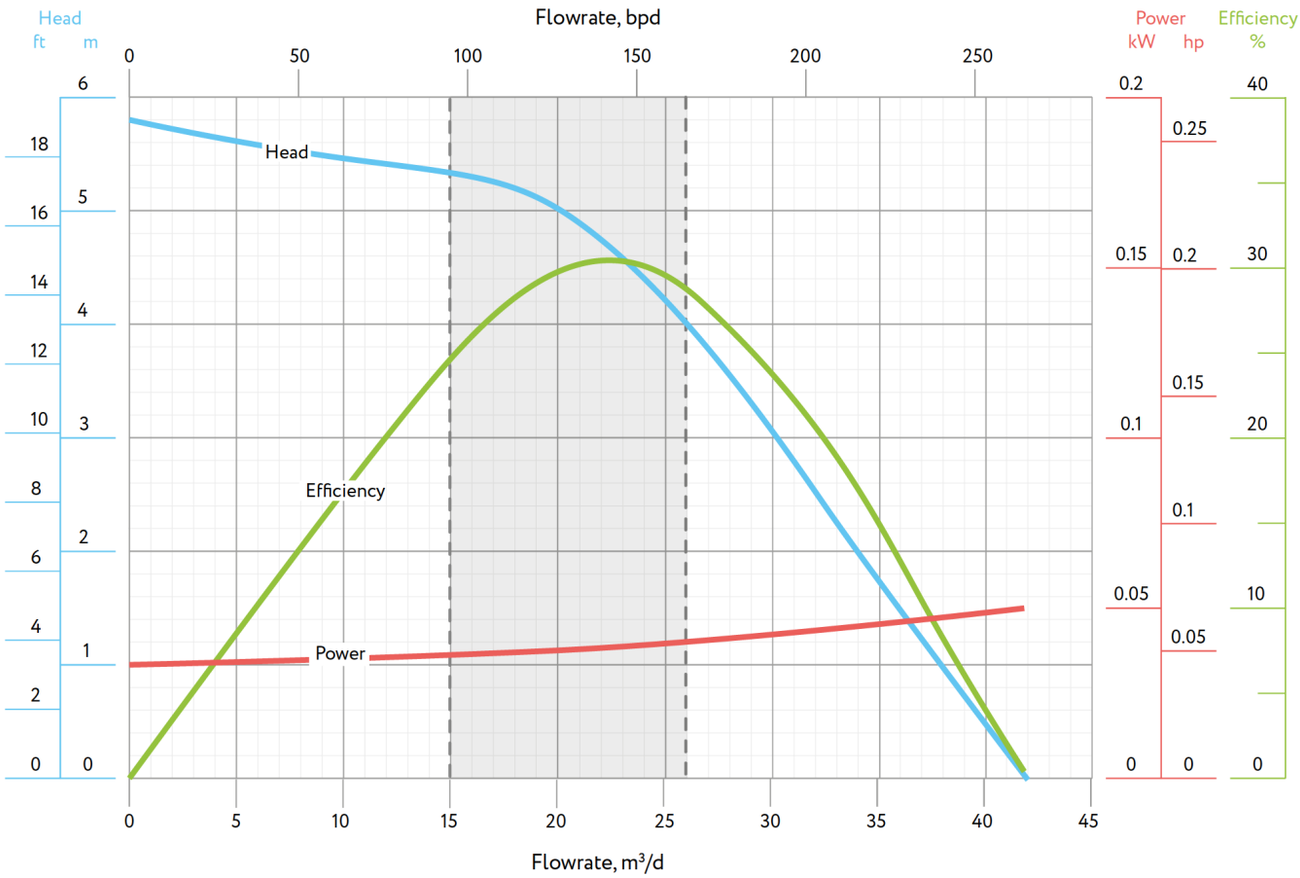
60 HZ-3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		30.5 %	
	housing pressure limit	6,000 psi	465 bar	Pump	optimum flow rate	169 bpd	27 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	113 - 197 bpd	18 – 31 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	Stage	head	22.2 ft	6.8 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.091 hp	0.068 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



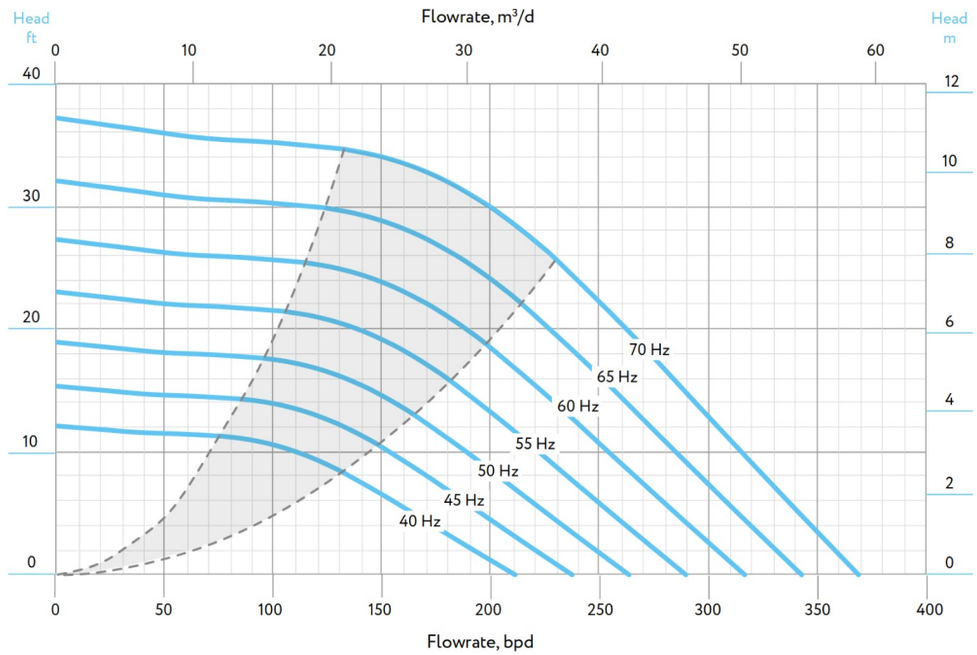
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		30.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	138 bpd	22 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	94 - 164 bpd	15 - 26 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	15.4 ft	4.7 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.052 hp	0.039 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

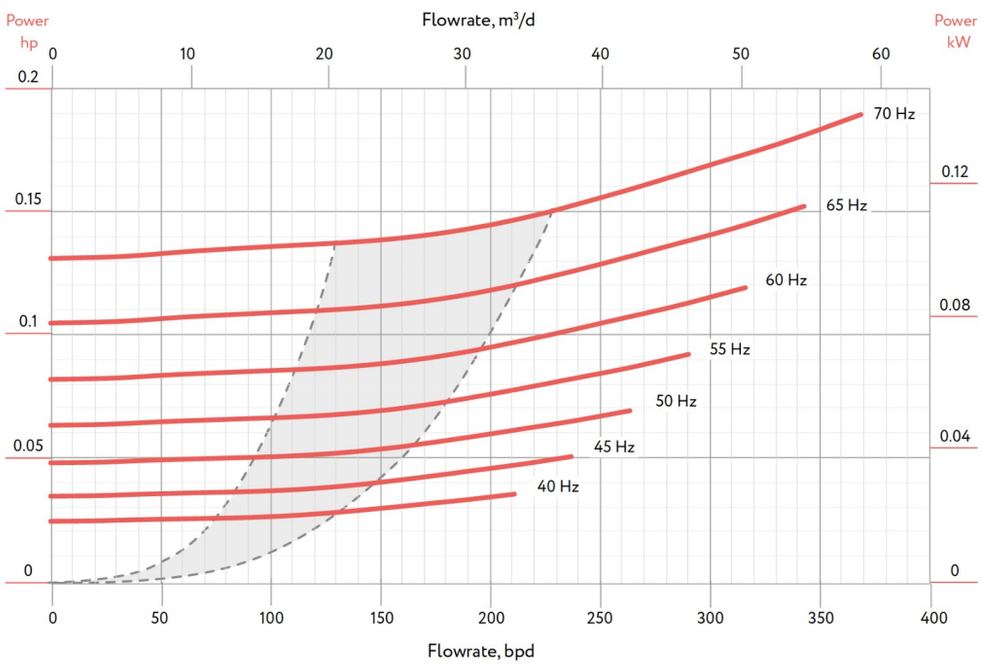
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



362 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	93	10.5	3.202	282	128
3.5M	111	12.1	3.702	320	145
4M	129	13.8	4.202	360	163
4.5M	147	15.4	4.702	397	180
5M	164	17.1	5.202	435	197

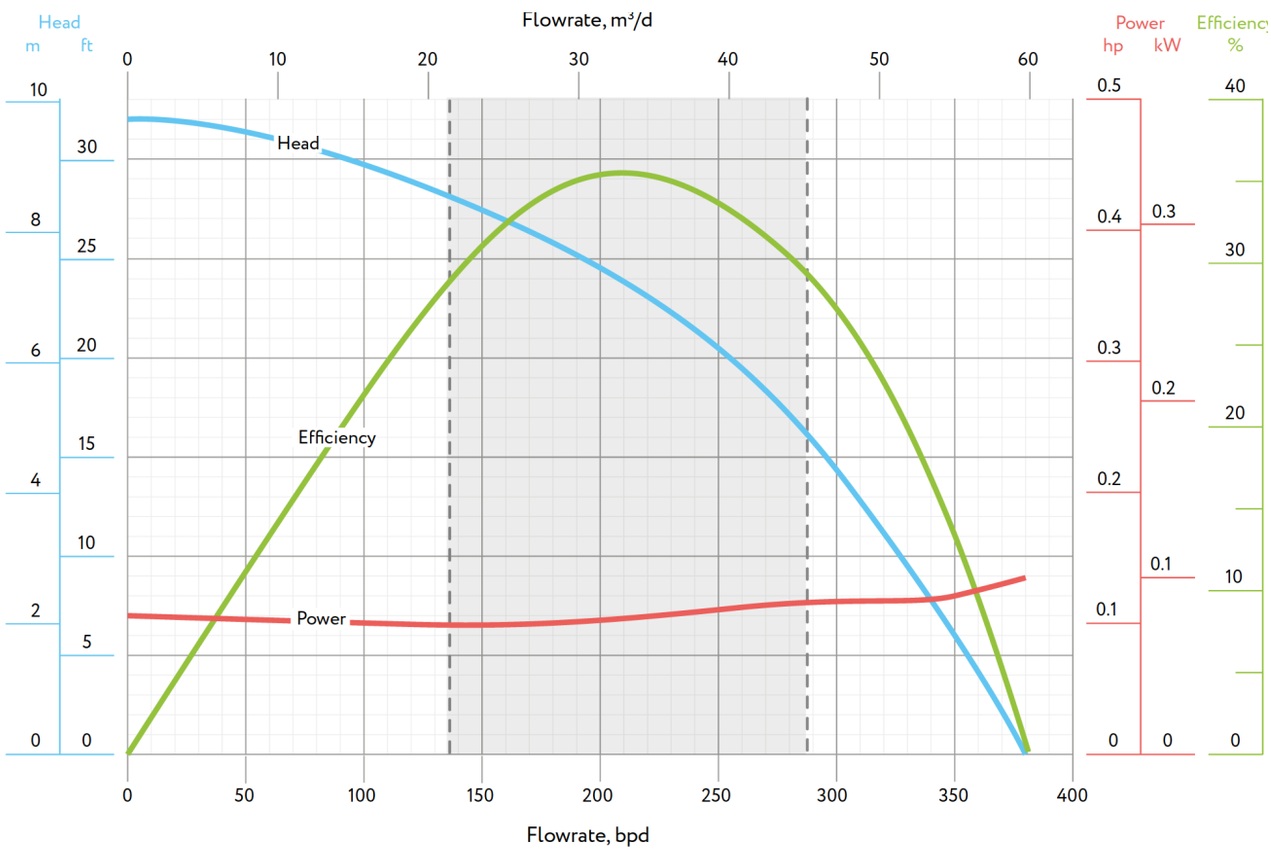
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	103	10.5	3.202	262	119
3.5M	121	12.1	3.702	297	135
4M	139	13.8	4.202	333	151
4.5M	156	15.4	4.702	368	167
5M	174	17.1	5.202	403	183
5.5M	192	18.7	5.702	438	199
6M	210	20.3	6.202	469	213

ESP-OS A 362-200

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

60 HZ-3,500 RPM

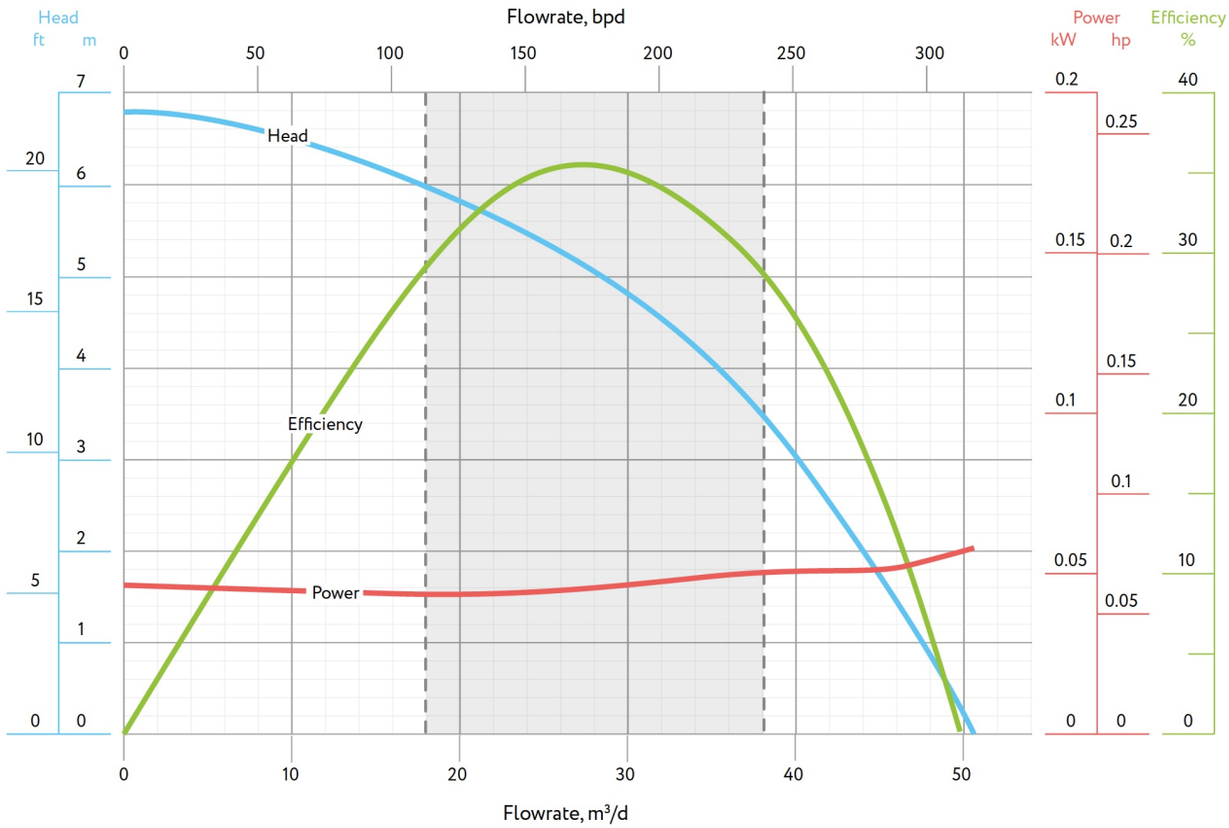
Housing	outer diameter	3.62 in.	92 mm	Best efficiency		35 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	209 bpd	33 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	136 - 287 bpd	22 - 46 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	23.7 ft	7.2 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.104 hp	0.077 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

quality integrity innovations

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		35 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	176 bpd	28 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	113 - 239 bpd	18 - 38 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	16.4 ft	5.0 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.060 hp	0.045 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

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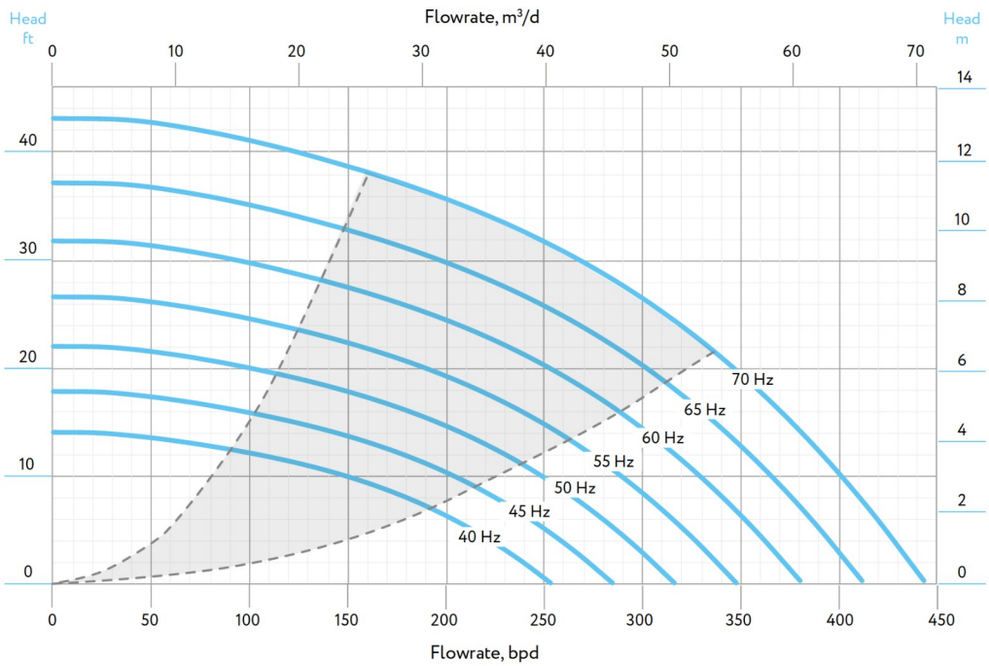
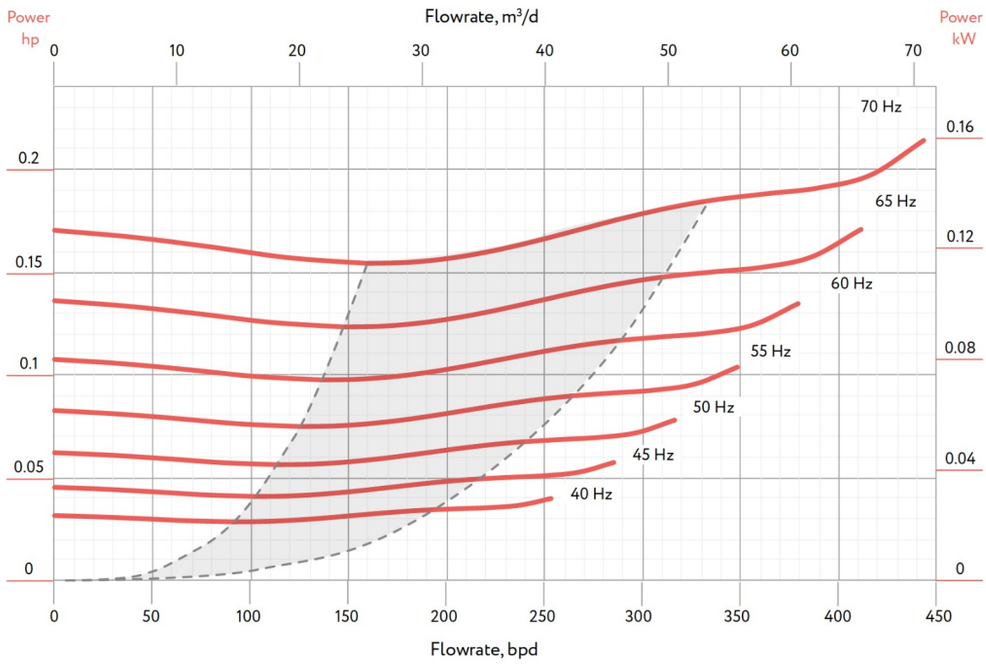
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



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362 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	31	3.9	1.202	132	60
2M	71	7.2	2.202	213	97
3M	108	10.5	3.202	304	138

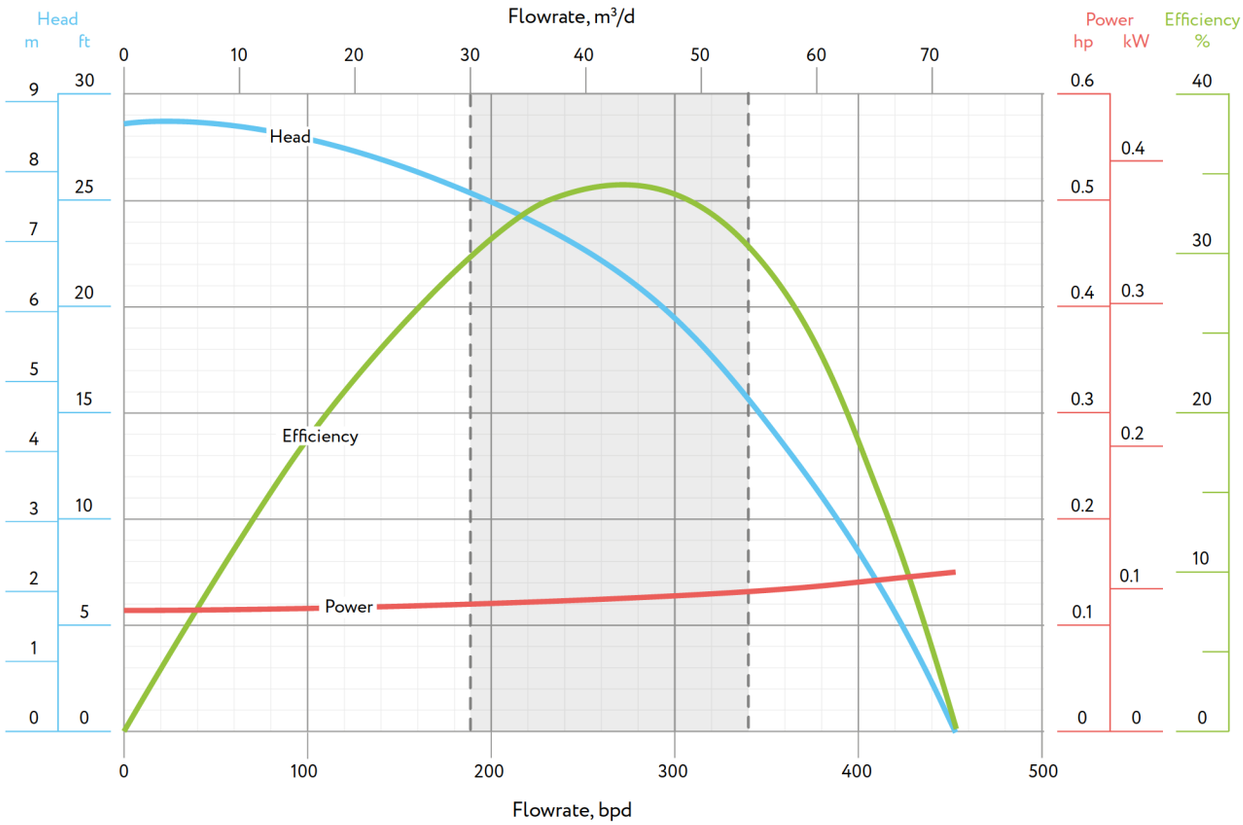
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	117	10.5	3.202	262	119
3.5M	137	12.1	3.702	297	135
4M	158	13.8	4.202	333	151
4.5M	178	15.4	4.702	368	167
5M	198	17.1	5.202	403	183
5.5M	218	18.7	5.702	438	199
6M	238	20.3	6.202	470	213

ESP-OS A 362-270

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

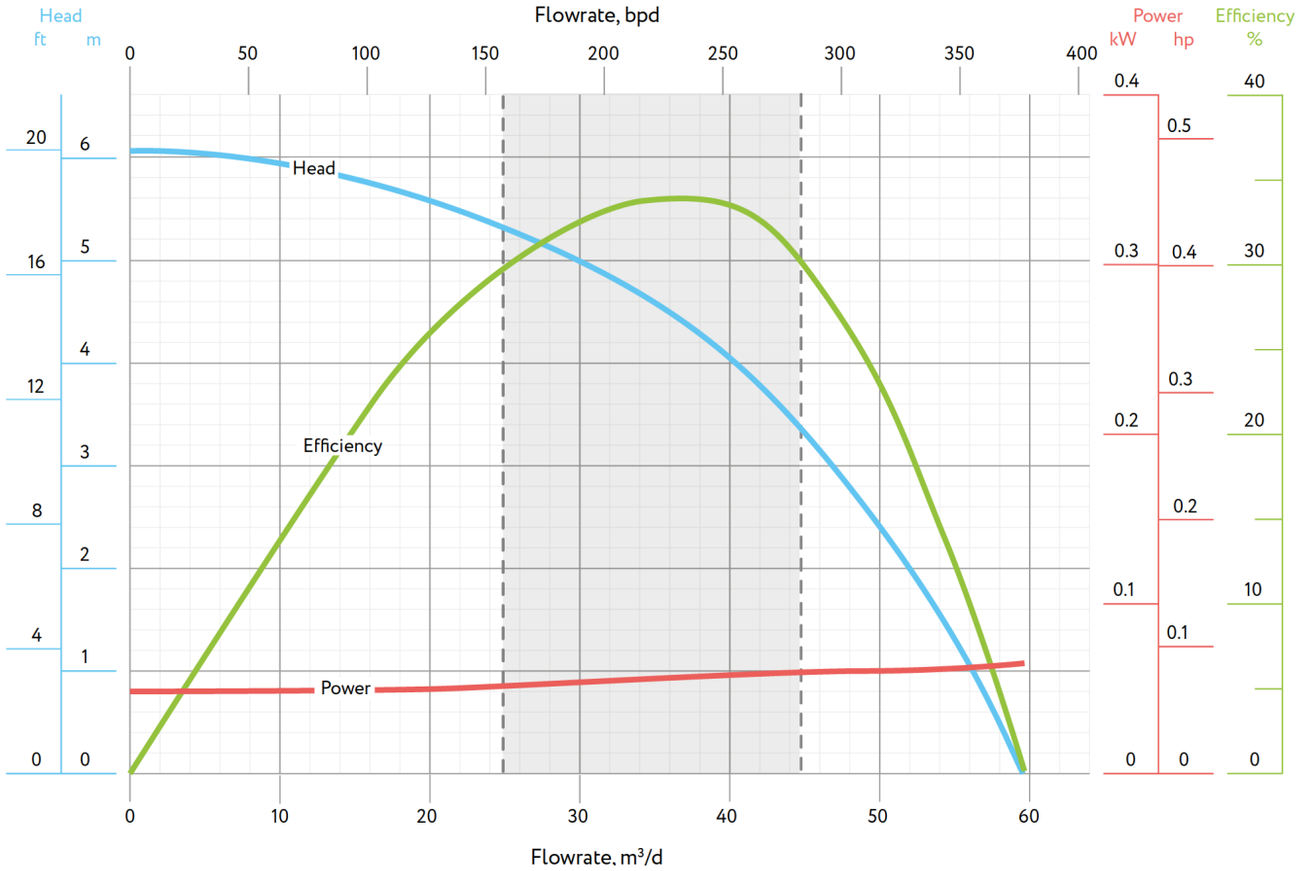
60 HZ-3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		34 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	274 bpd	43 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	189 - 340 bpd	30 - 54 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	21.1 ft	6.4 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.125 hp	0.093 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



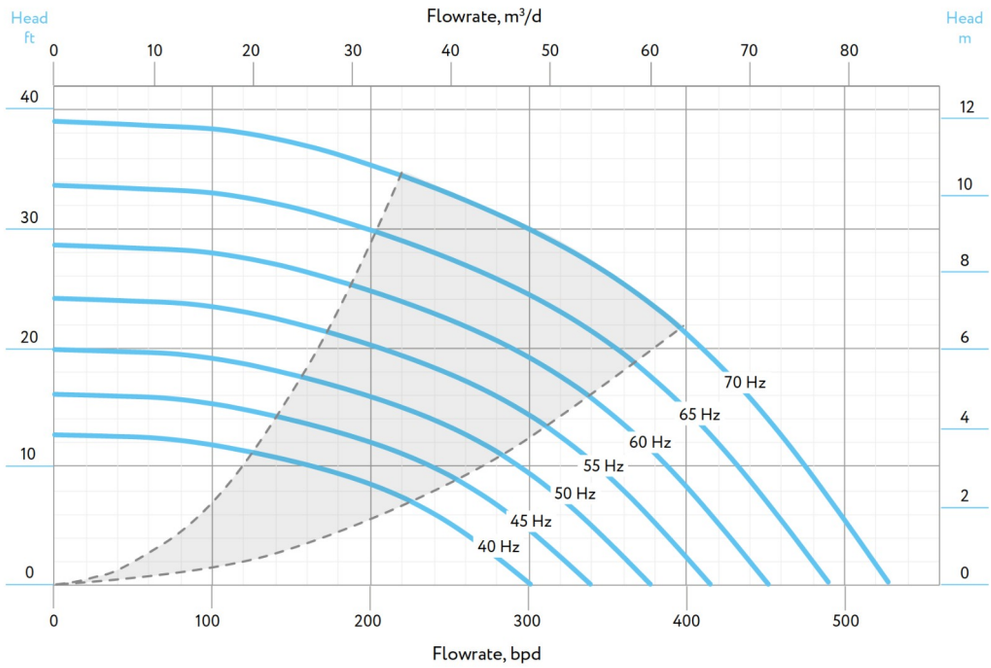
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		34 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	226 bpd	36 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	157 - 283 bpd	25 - 45 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	14.8 ft	4.5 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.072 hp	0.054 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

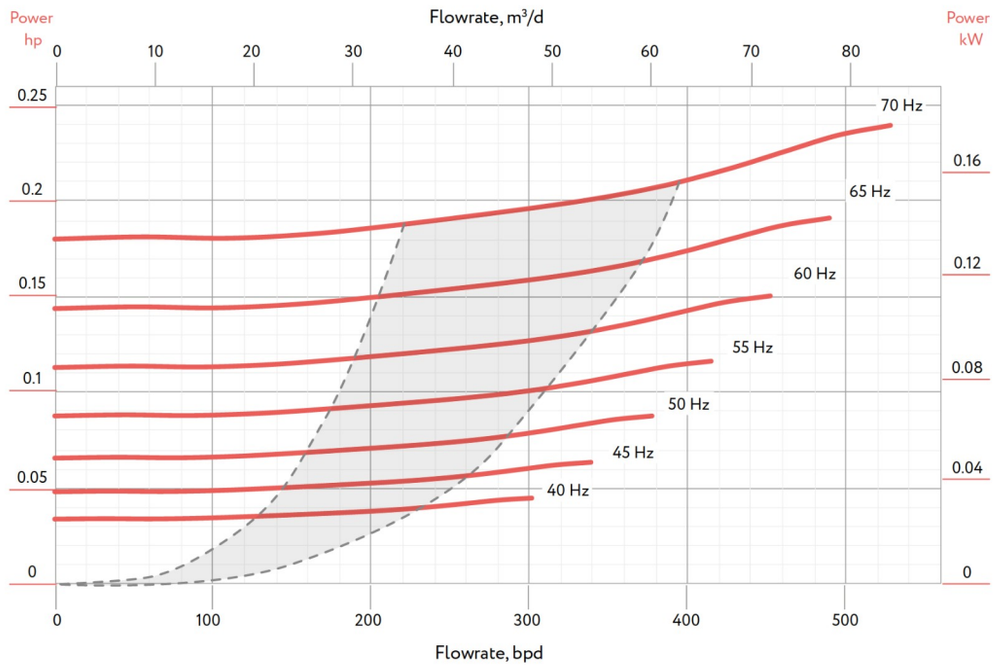
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



362 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	31	3.9	1.202	132	60
2M	71	7.2	2.202	213	97
3M	108	10.5	3.202	304	138

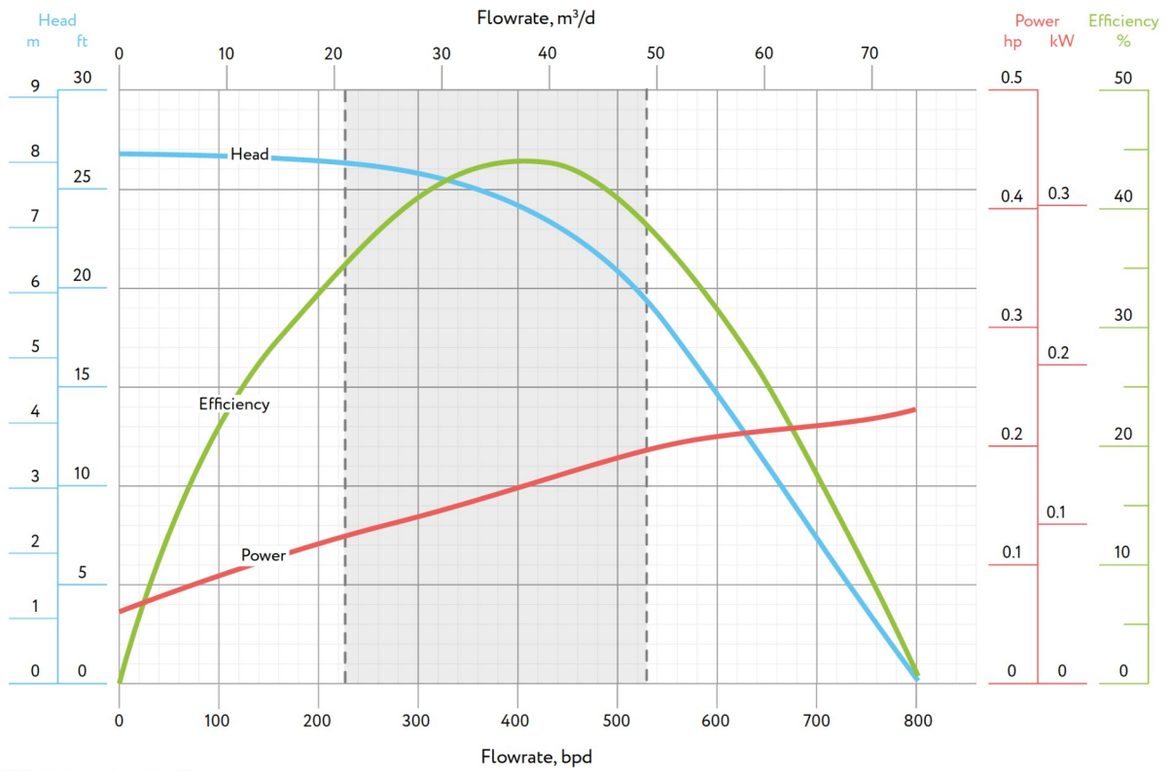
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	117	10.5	3.202	262	119
3.5M	137	12.1	3.702	297	135
4M	157	13.8	4.202	333	151
4.5M	178	15.4	4.702	368	167
5M	198	17.1	5.202	403	183
5.5M	218	18.7	5.702	438	199
6M	238	20.3	6.202	469	213

ESP-OS A 362-400

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

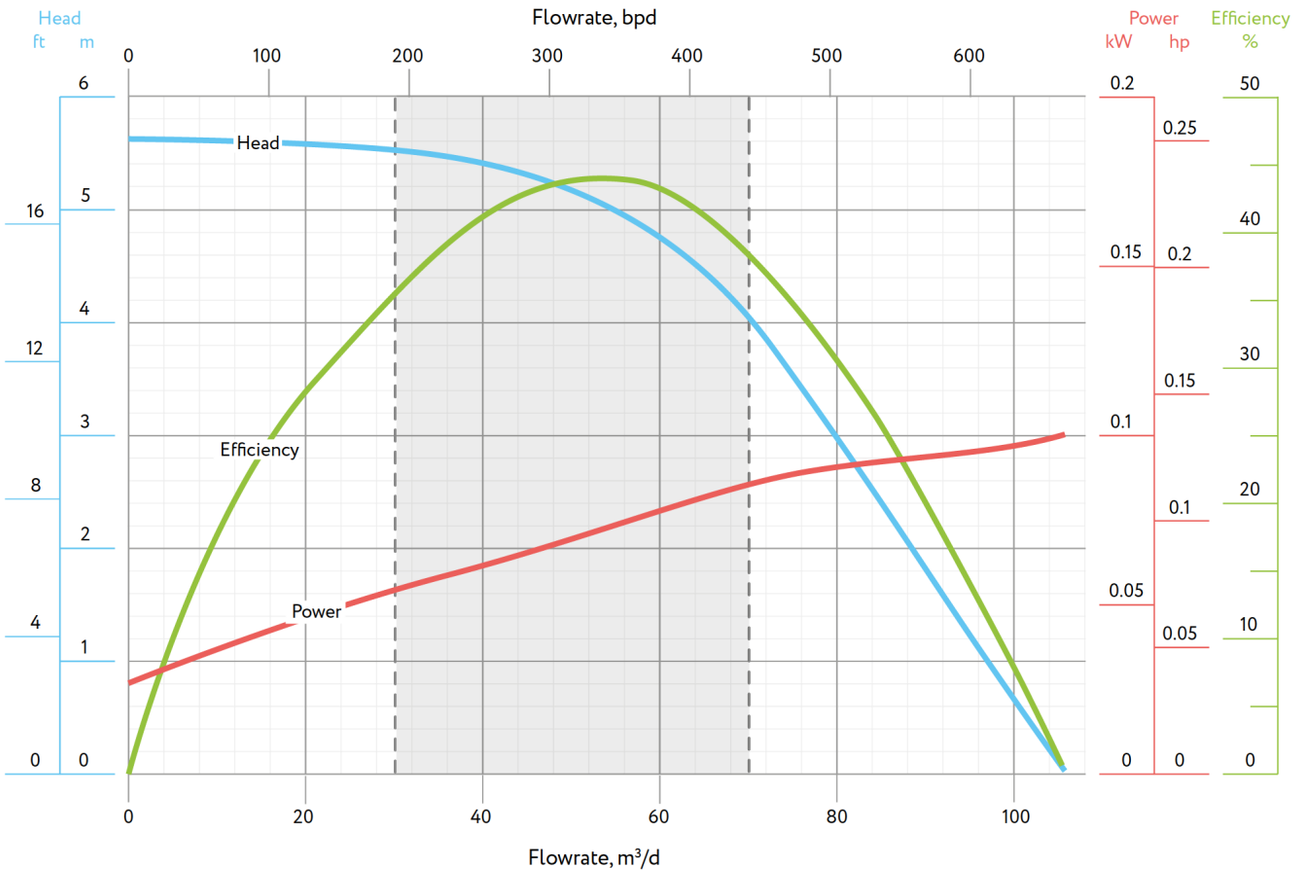
60 HZ-3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		44 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	400 bpd	64 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	227 - 530 bpd	36 - 84 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	24.3 ft	7.4 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.164 hp	0.122 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



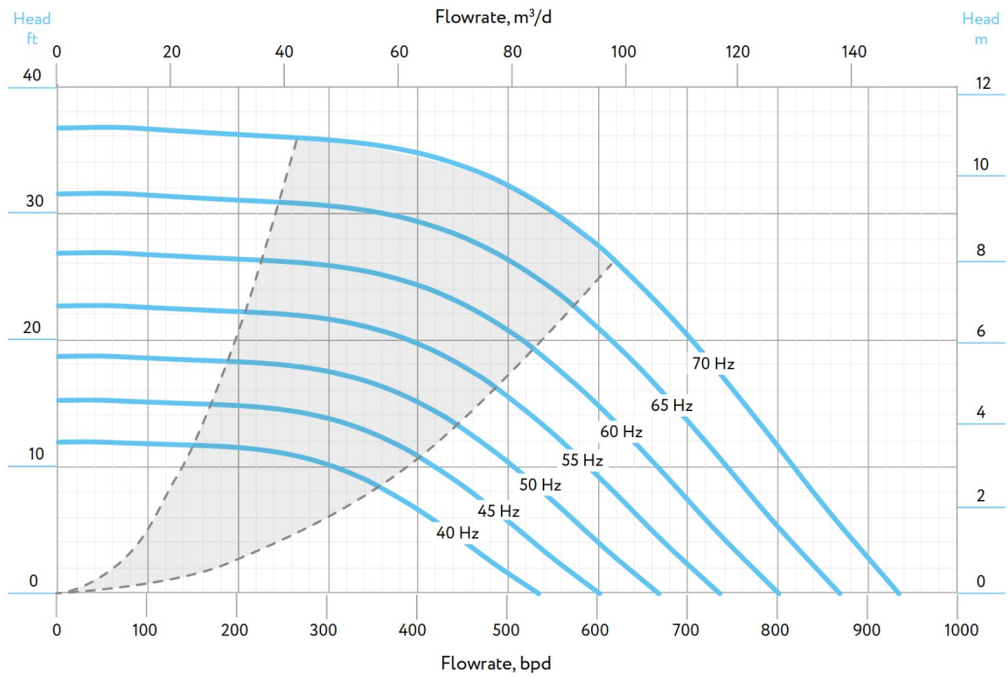
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		44 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	333 bpd	53 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	189 – 440 bpd	30 - 70 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	16.7 ft	5.1 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.095 hp	0.071 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

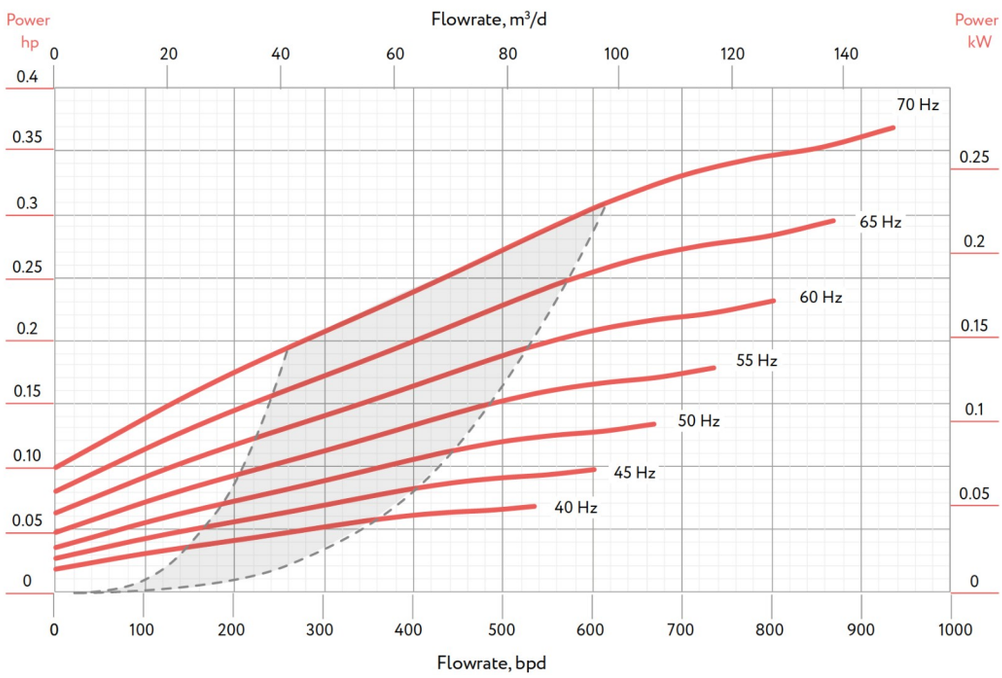
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



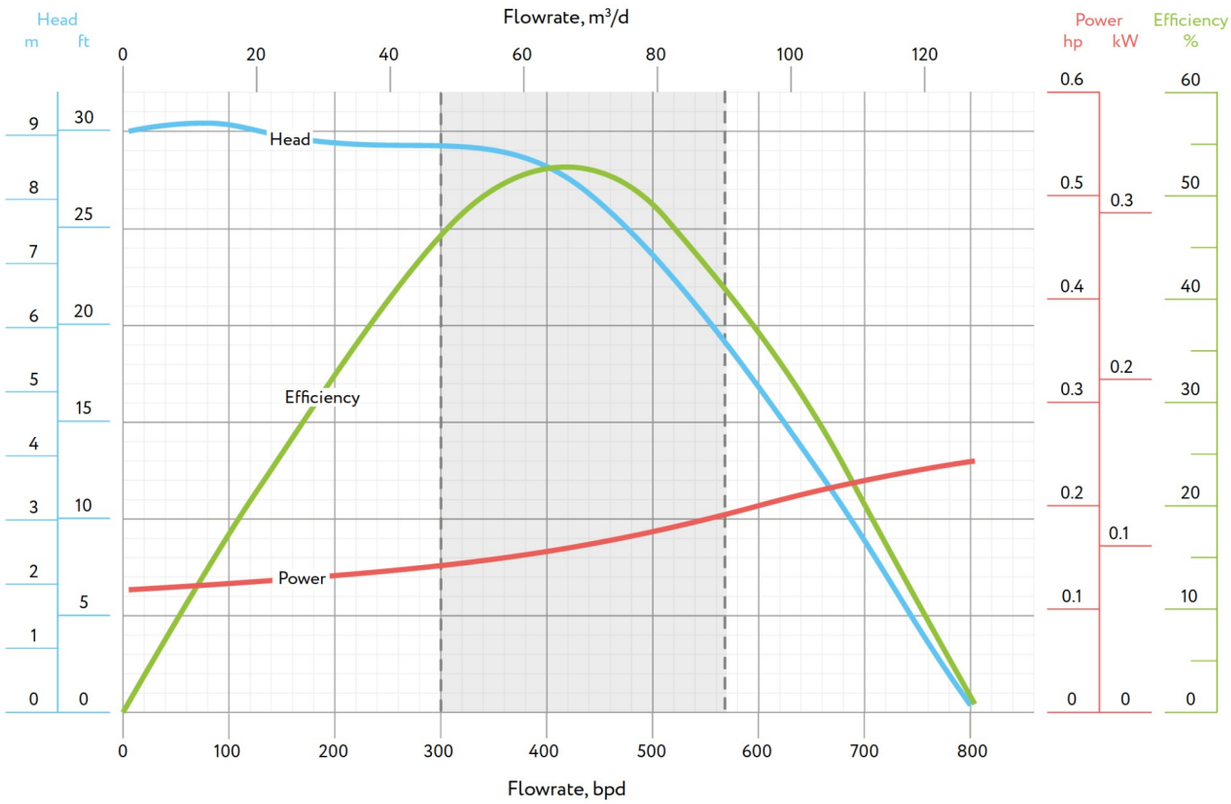
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	95	10.5	3.202	262	119
3.5M	111	12.1	3.702	297	135
4M	127	13.8	4.202	333	151
4.5M	144	15.4	4.702	368	167
5M	160	17.1	5.202	403	183
5.5M	177	18.7	5.702	438	199
6M	193	20.3	6.202	469	213

ESP-OS A 362-410

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

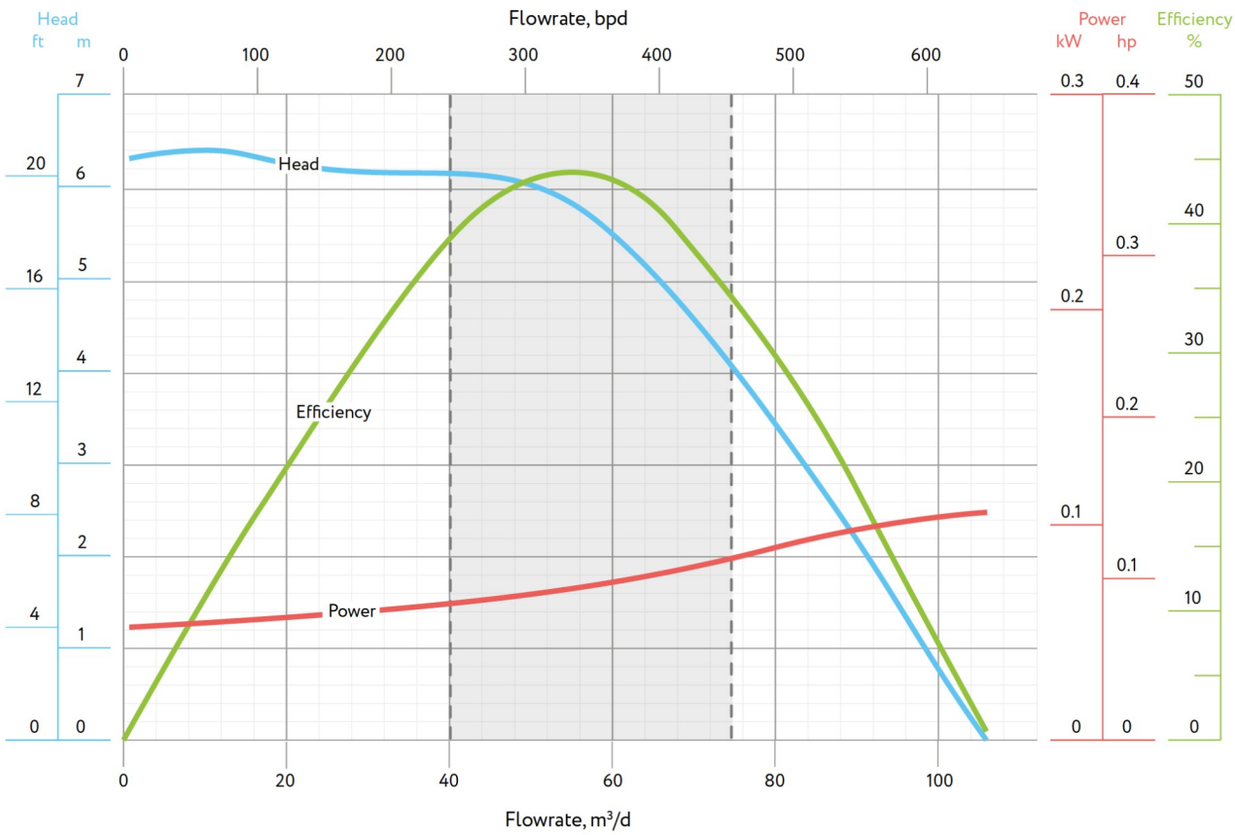
60 HZ-3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		52 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	414 bpd	66 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	303 - 567 bpd	48 - 90 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	27 ft	8.2 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.164 hp	0.122 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



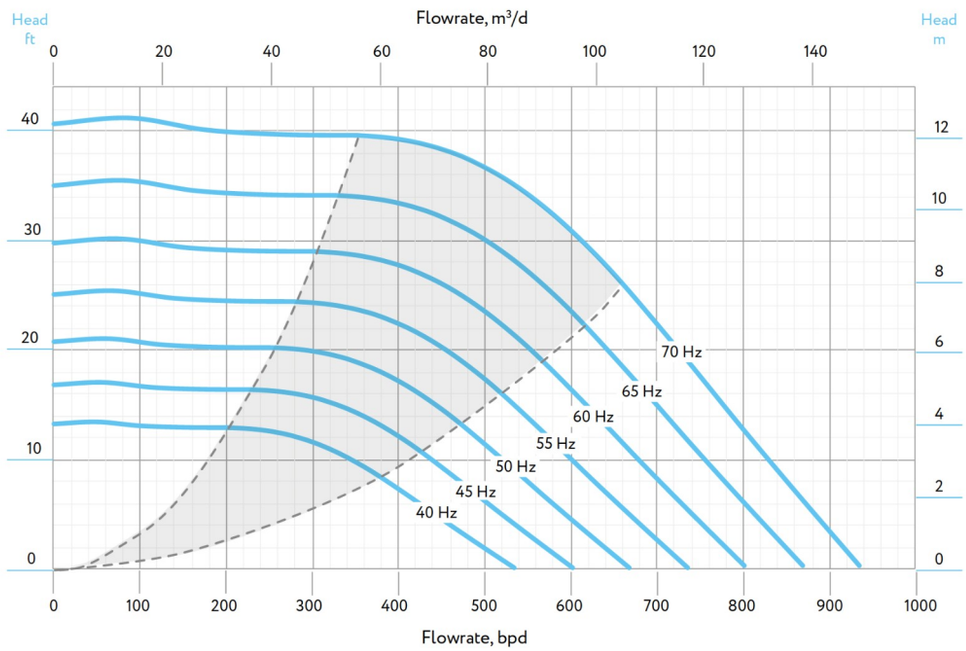
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		52 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	346 bpd	55 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	252 - 473 bpd	40 - 75 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	19.0 ft	5.8 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.093 hp	0.069 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

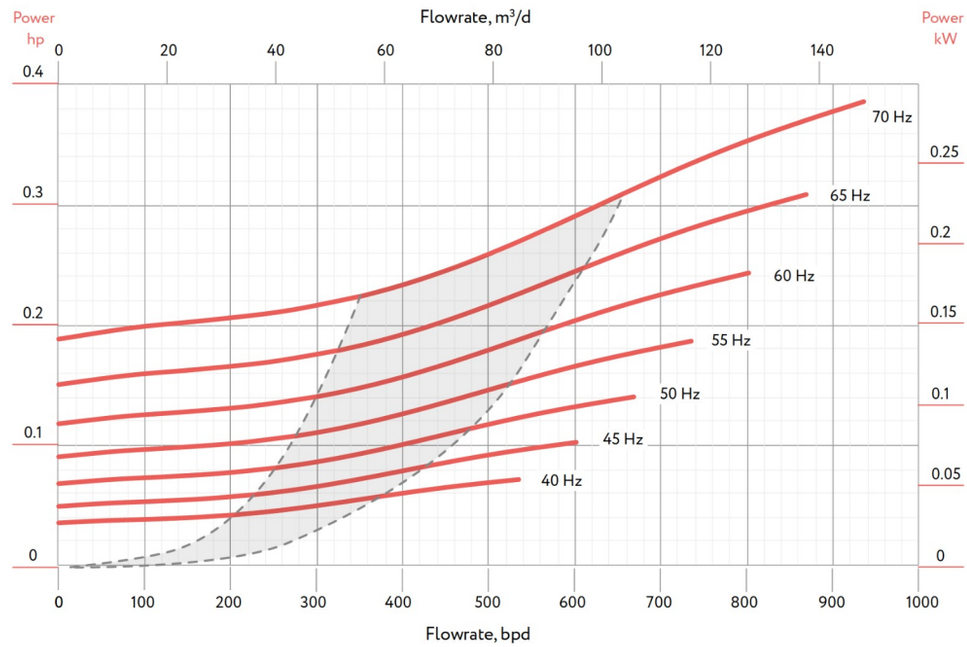
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



362 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	28	3.9	1.202	132	60
2M	60	7.2	2.202	213	97
2.5M	79	8.9	2.702	253	115

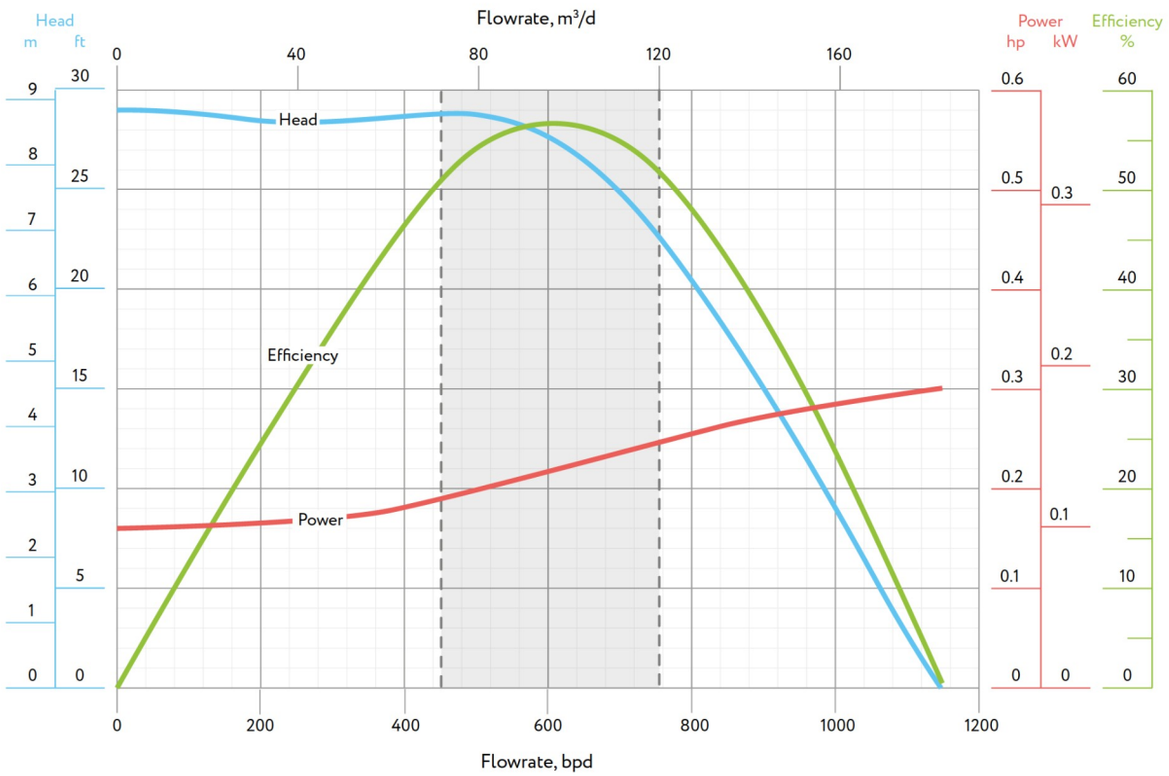
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	95	10.5	3.202	262	119
3.5M	111	12.1	3.702	297	135
4M	127	13.8	4.202	333	151
4.5M	144	15.4	4.702	368	167
5M	160	17.1	5.202	403	183
5.5M	177	18.7	5.702	438	199
6M	193	20.3	6.202	469	213

ESP-OS A 362-600

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

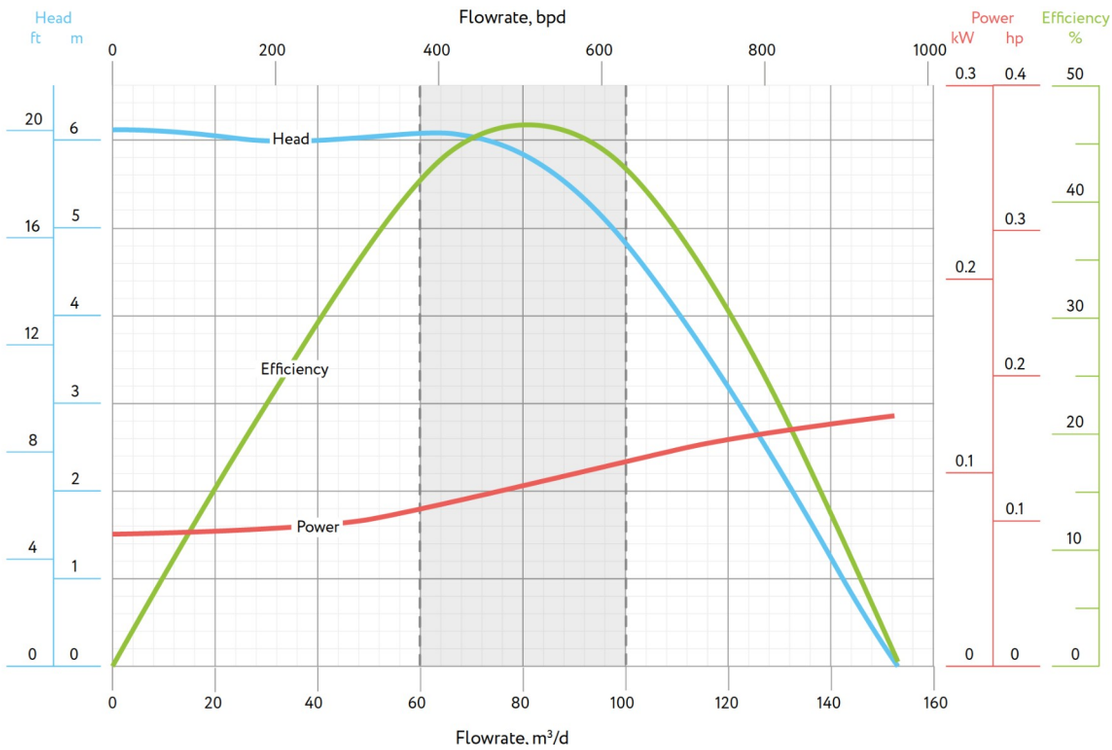
60 HZ-3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		56.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	614 bpd	98 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	454 - 756 bpd	72 - 120 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm2	**Stage**	head	27.3 ft	8.3 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.219 hp	0.163 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



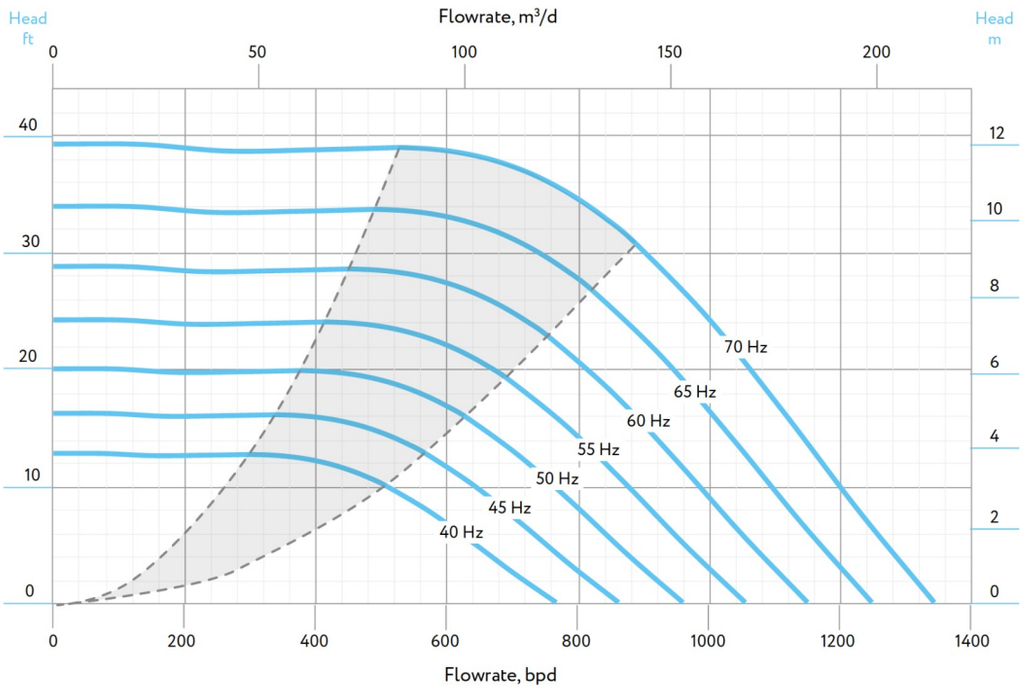
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		56.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	509 bpd	81 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	377 - 629 bpd	60 - 100 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	19.0 ft	5.8 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.126 hp	0.094 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

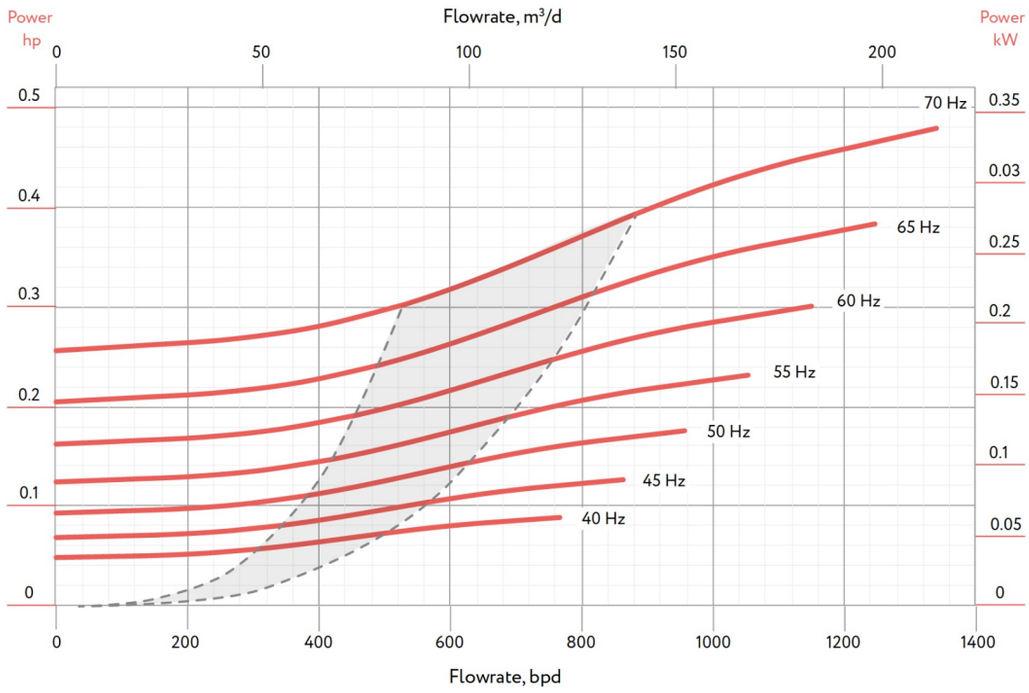
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



362 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	28	3.9	1.202	132	60
2M	60	7.2	2.202	213	97
2.5M	79	8.9	2.702	253	115

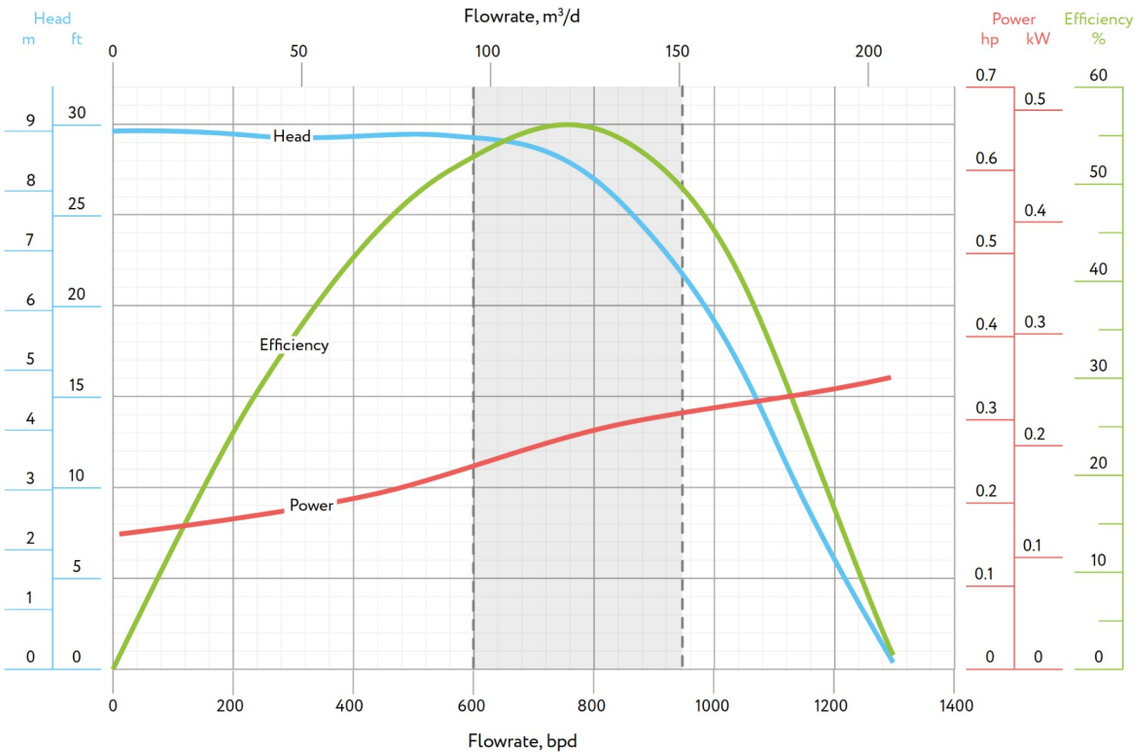
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	95	10.5	3.202	262	119
3.5M	111	12.1	3.702	297	135
4M	127	13.8	4.202	333	151
4.5M	144	15.4	4.702	368	167
5M	160	17.1	5.202	403	183
5.5M	177	18.7	5.702	438	199
6M	193	20.3	6.202	469	213

ESP-OS A 362-750

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

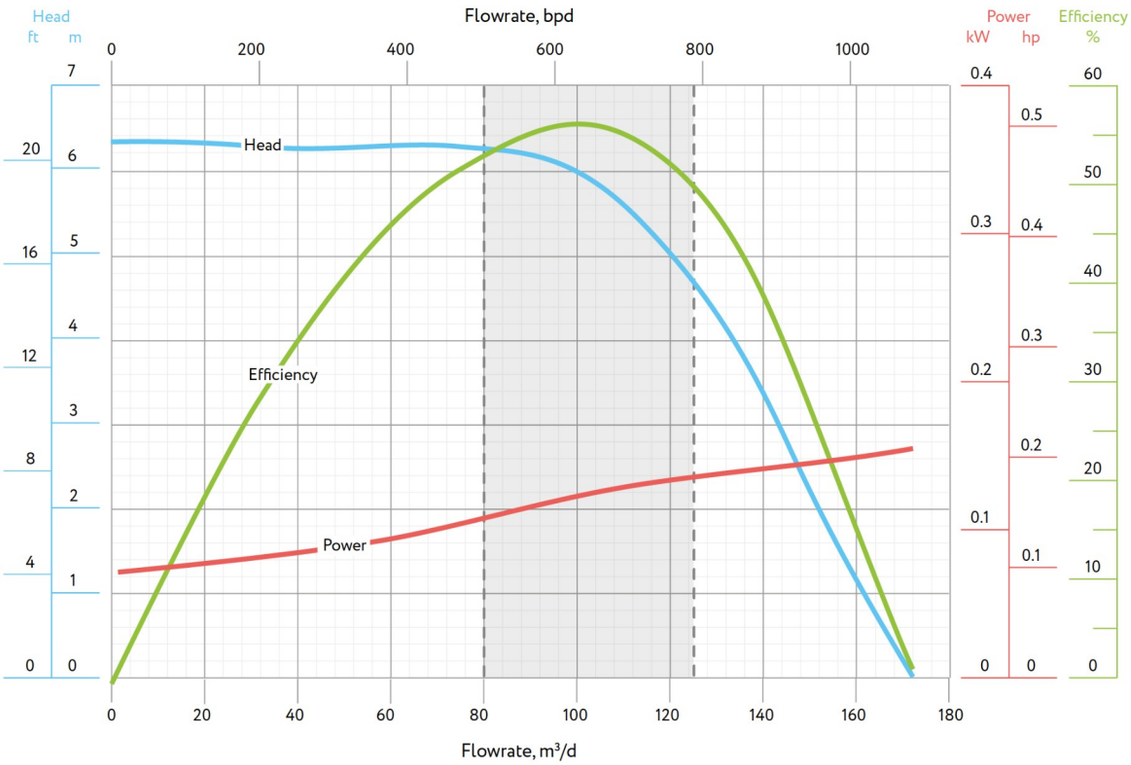
60 HZ-3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		56 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	749 bpd	119 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	605 - 946 bpd	96 - 150 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	28.0 ft	8.5 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.276 hp	0.206 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



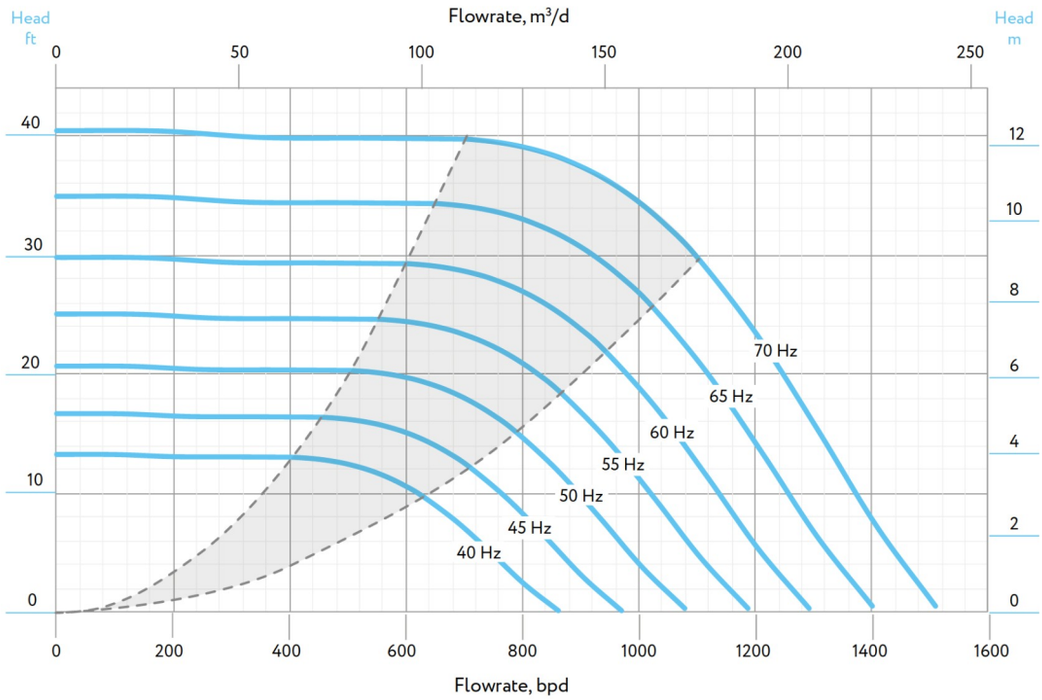
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		56 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	623 bpd	99 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	503 - 786 bpd	80 - 125 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	19.4 ft	5.9 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.160 hp	0.119 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

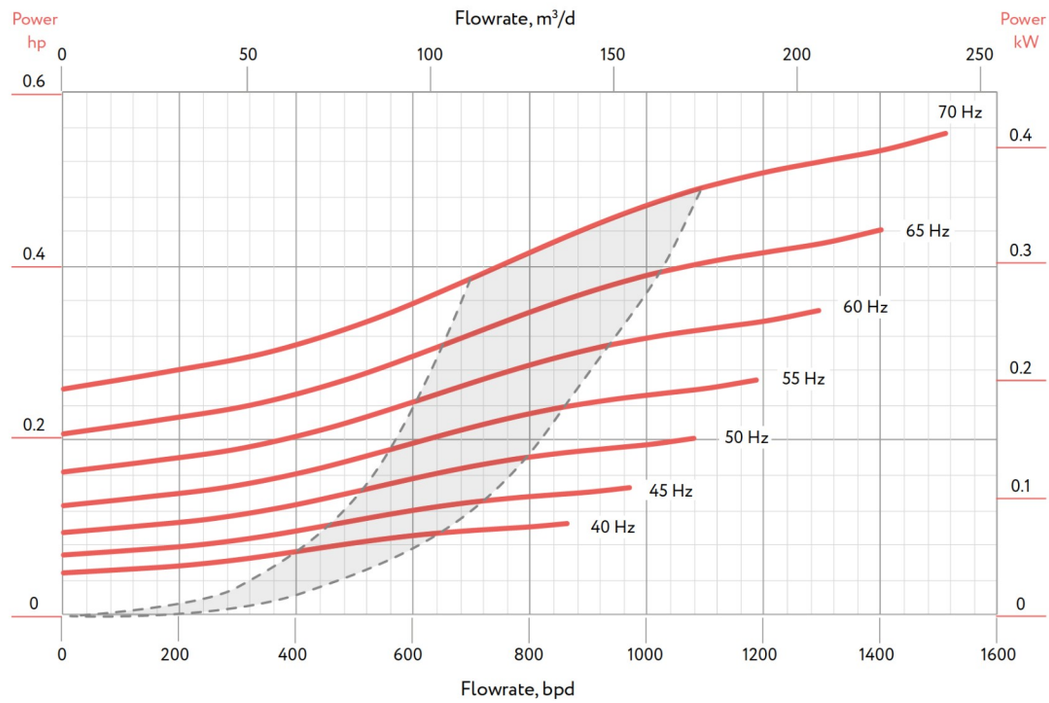
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



362 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	25	3.9	1.202	132	60
2M	55	7.2	2.202	213	97
2.5M	69	8.9	2.702	253	115

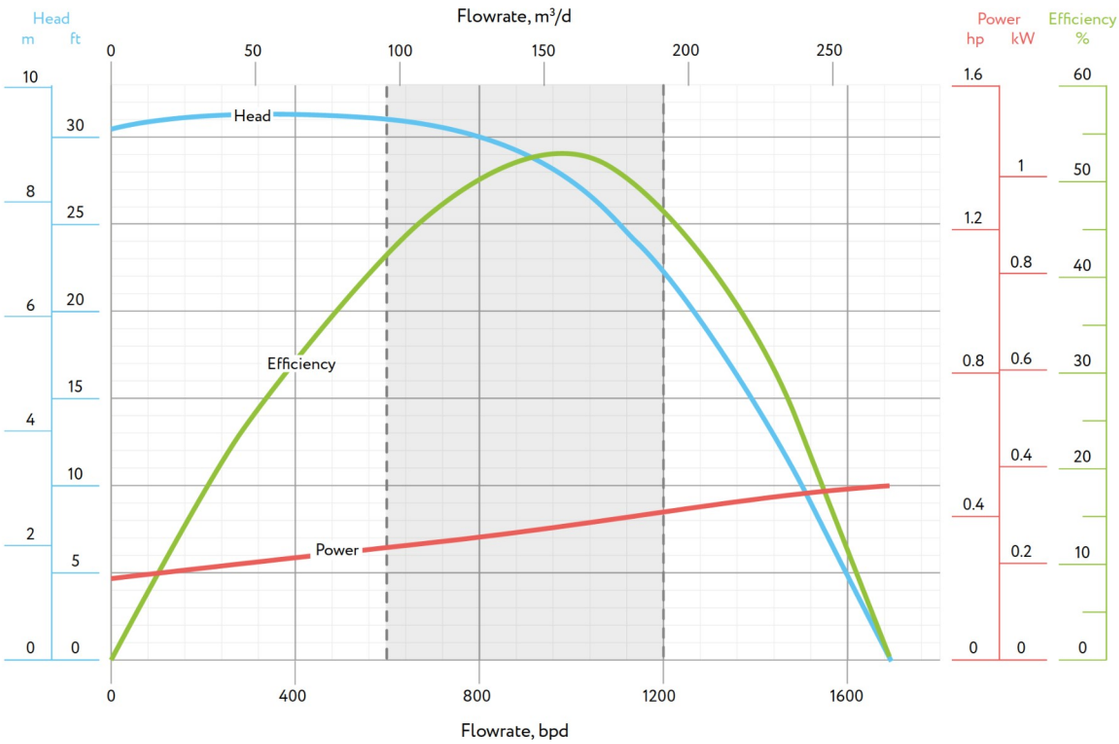
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	95	10.5	3.202	262	119
3.5M	111	12.1	3.702	297	135
4M	127	13.8	4.202	333	151
4.5M	144	15.4	4.702	368	167
5M	160	17.1	5.202	403	183
5.5M	177	18.7	5.702	438	199
6M	193	20.3	6.202	469	213

ESP-OS A 362-950

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

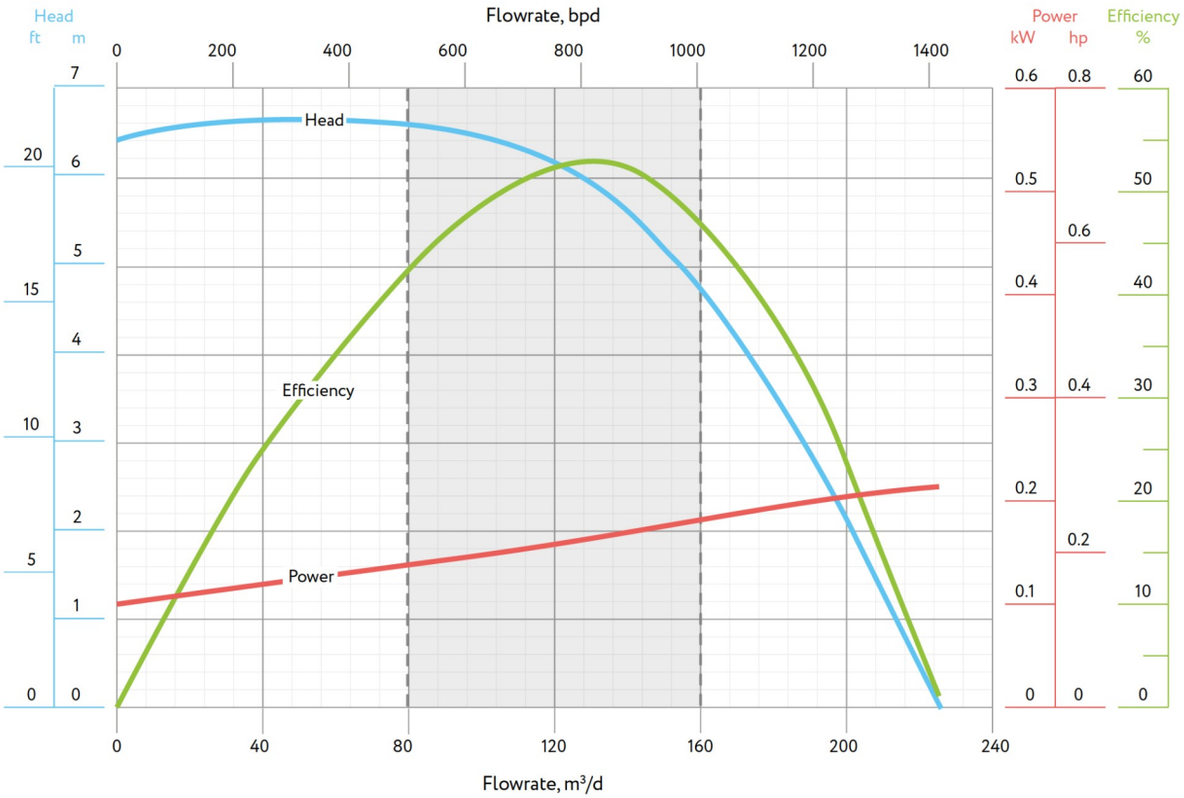
60 HZ-3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		53 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	972 bpd	155 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	605 - 1,210 bpd	96 - 192 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	28.0 ft	8.5 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.380 hp	0.283 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



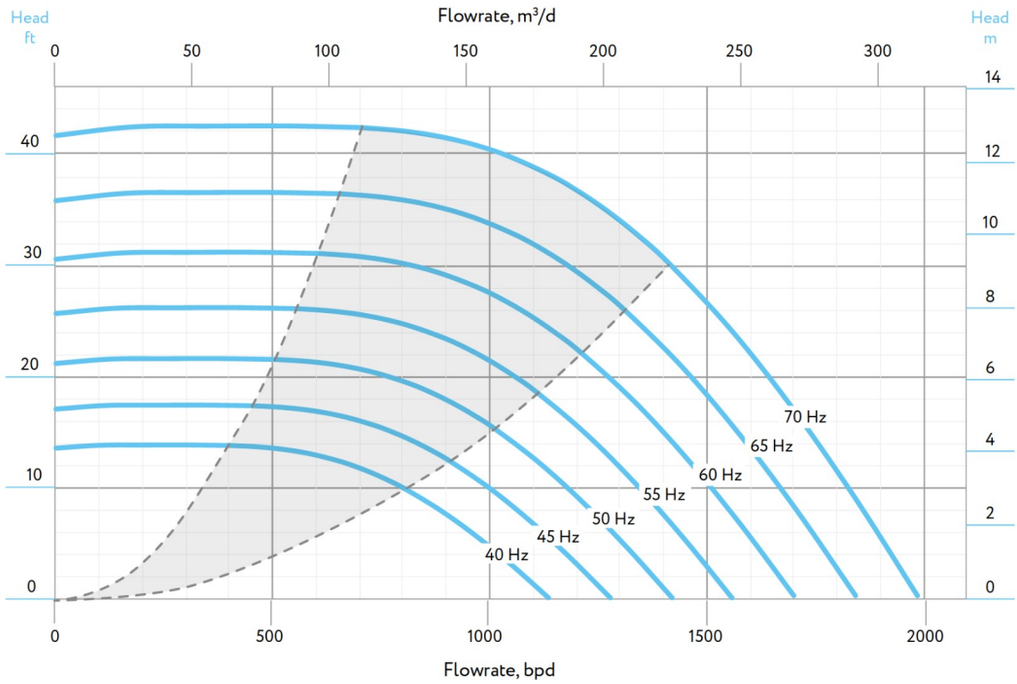
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		53 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	811 bpd	129 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	503 - 1,006 bpd	80 - 160 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	19.4 ft	5.9 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.220 hp	0.164 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

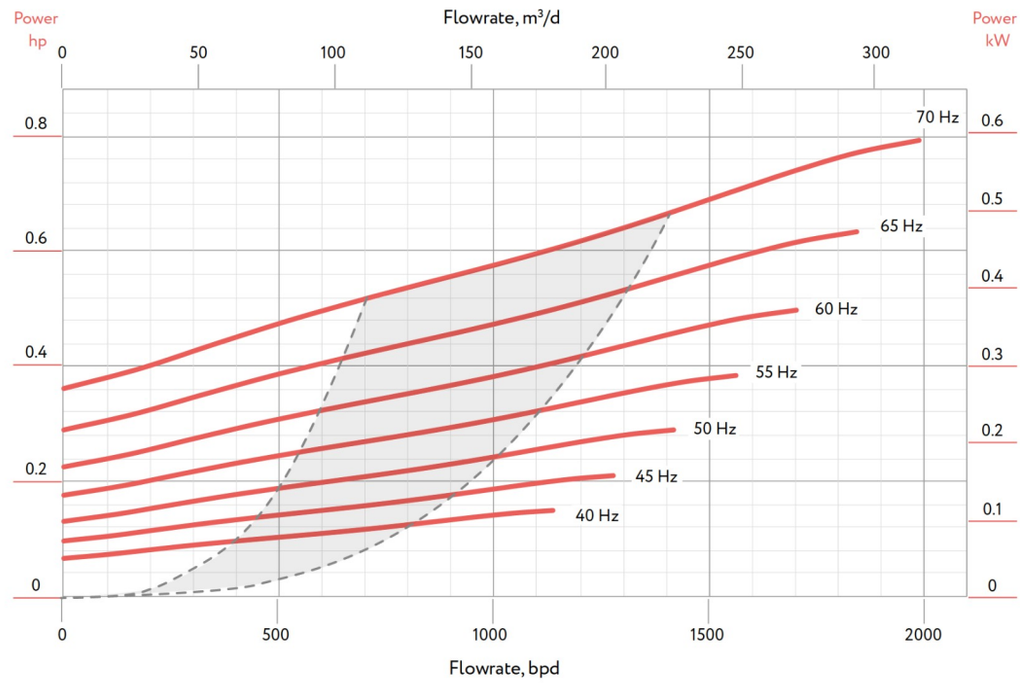
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	22	3.9	1.202	132	60
2M	49	7.2	2.202	213	97
3M	76	10.5	3.202	260	118

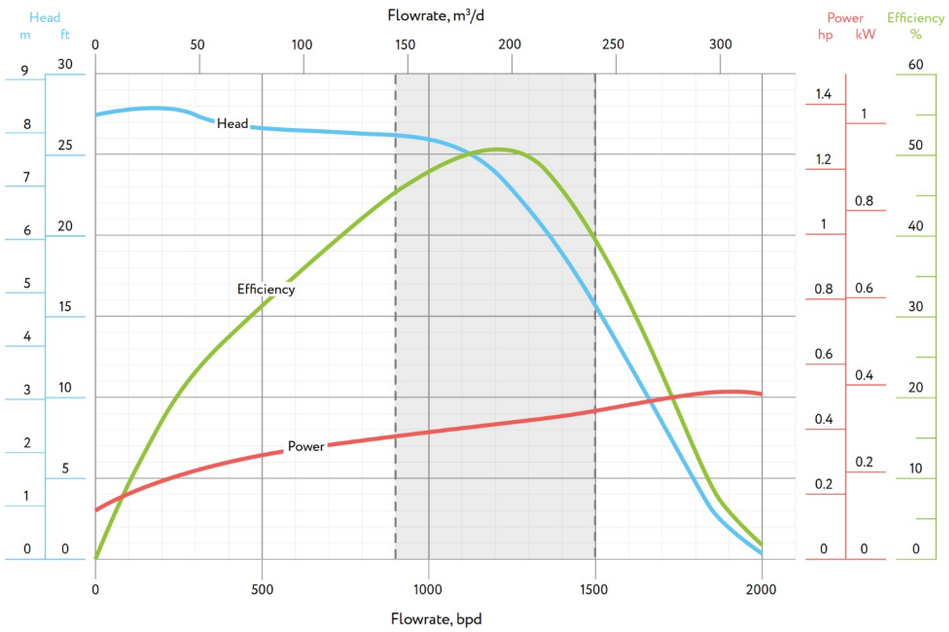
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	84	10.5	3.202	262	119
3.5M	99	12.1	3.702	297	135
4M	114	13.8	4.202	333	151
4.5M	128	15.4	4.702	370	168
5M	143	17.1	5.202	403	183
5.5M	157	18.7	5.702	441	200
6M	172	20.3	6.202	474	215

ESP-OS A 362-1200

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

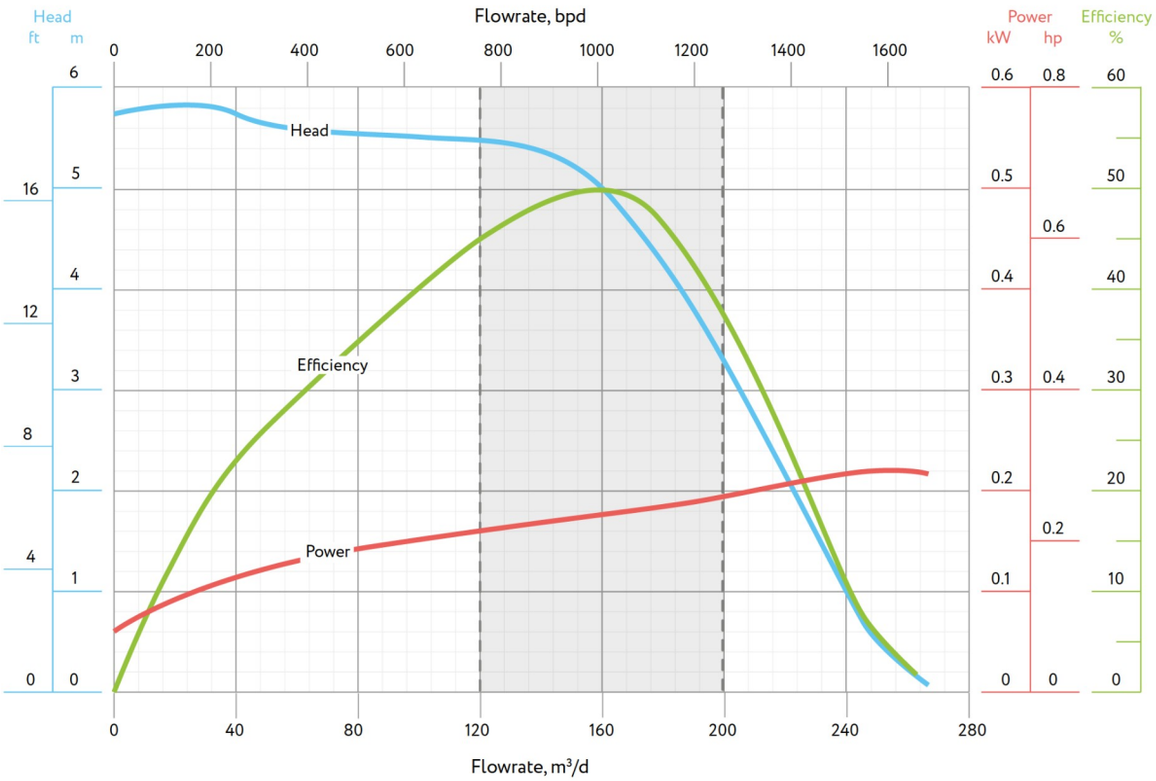
60 HZ -3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		50 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,190 bpd	189 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	908 - 1,513 bpd	144 - 241 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	24.0 ft	7.3 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.420 hp	0.313 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



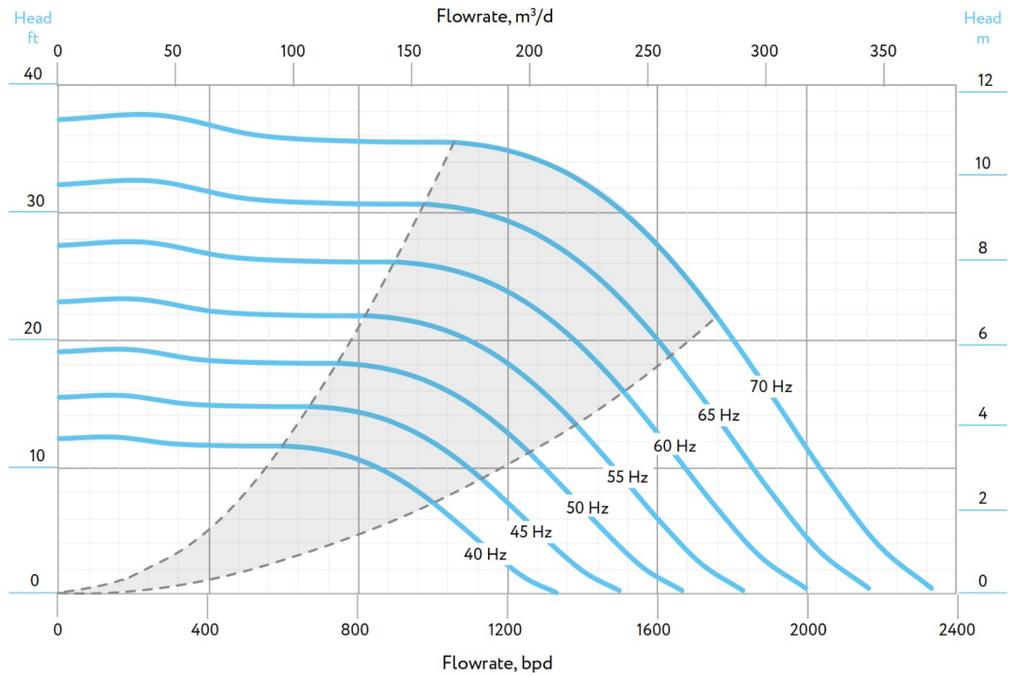
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		50 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	994 bpd	158 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	755 - 1,258 bpd	120 - 200 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	16.7 ft	5.1 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.243 hp	0.181 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

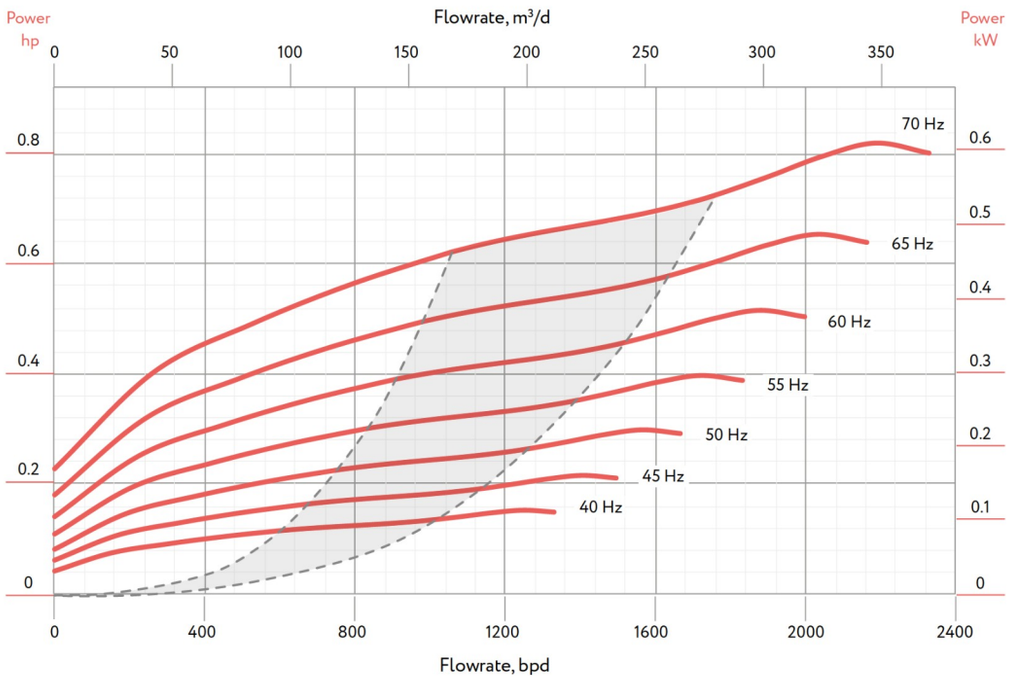
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



362 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	72	10.5	3.202	265	120
3.5M	83	12.1	3.702	300	136
4M	97	13.8	4.202	335	152
4.5M	109	15.4	4.702	373	169
5M	120	17.1	5.202	406	184
5.5M	134	18.7	5.702	443	201

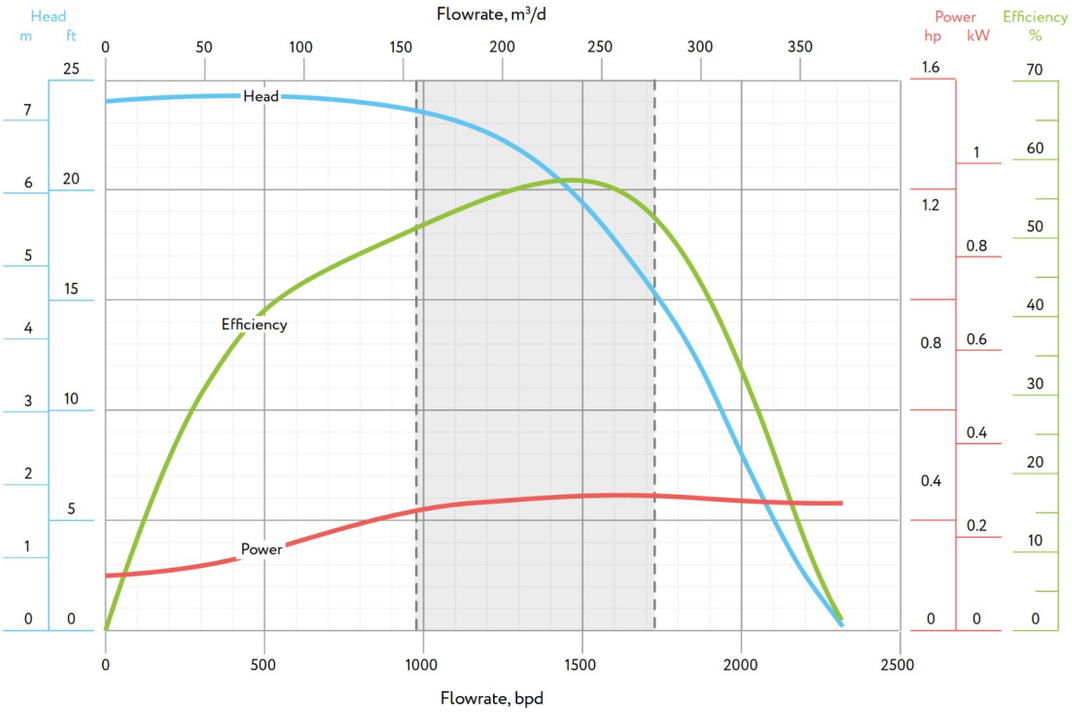
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	80	10.5	3.202	265	120
3.5M	94	12.1	3.702	300	136
4M	108	13.8	4.202	335	152
4.5M	122	15.4	4.702	373	169
5M	135	17.1	5.202	406	184
5.5M	149	18.7	5.702	443	201
6M	163	20.3	6.202	477	216

ESP-OS A 362-1400

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

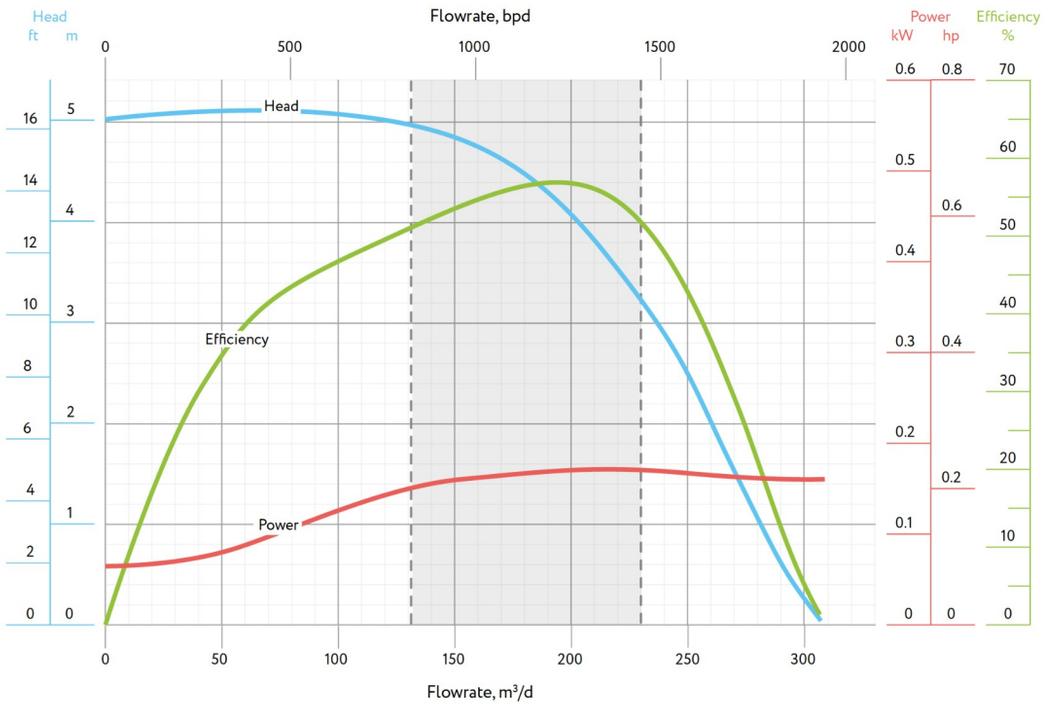
60 HZ -3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		56.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,469 bpd	234 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	983 - 1,740 bpd	156 - 277 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	19.9 ft	6.1 m
Shaft limit	standard (direct start)	201 hp	150 kW		power	0.382 hp	0.285 kW
	high-strength (soft start)	387 hp	288 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



TECHNICAL DATA

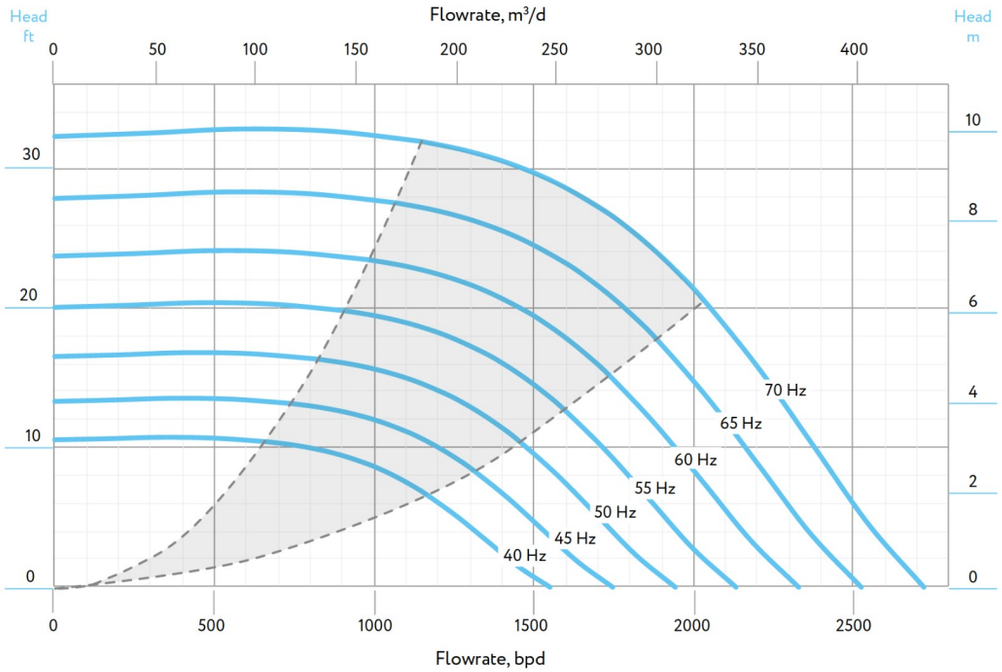
50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		56.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,226 bpd	195 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	818 — 1,447 bpd	130 - 230 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	13.8 ft	4.2 m
Shaft limit	standard (direct start)	168 hp	125 kW		power	0.221 hp	0.165 kW
	high-strength (soft start)	322 hp	240 kW		rotational direction	CW	

quality integrity innovations

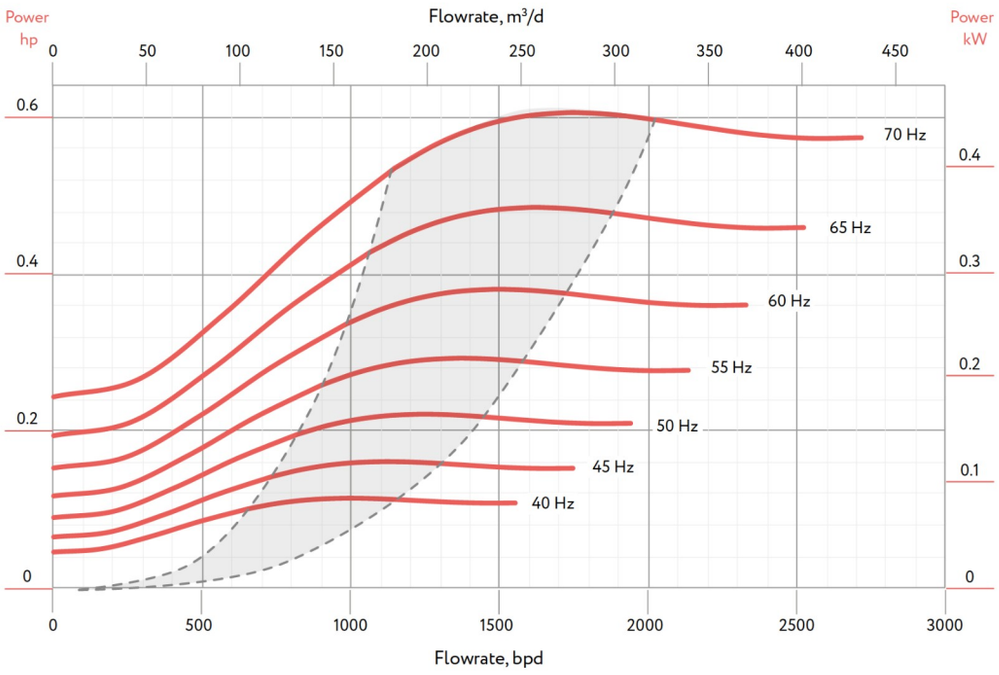
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	19	3.9	1.202	132	60
2M	42	7.2	2.202	213	97
3M	67	10.5	3.202	304	138

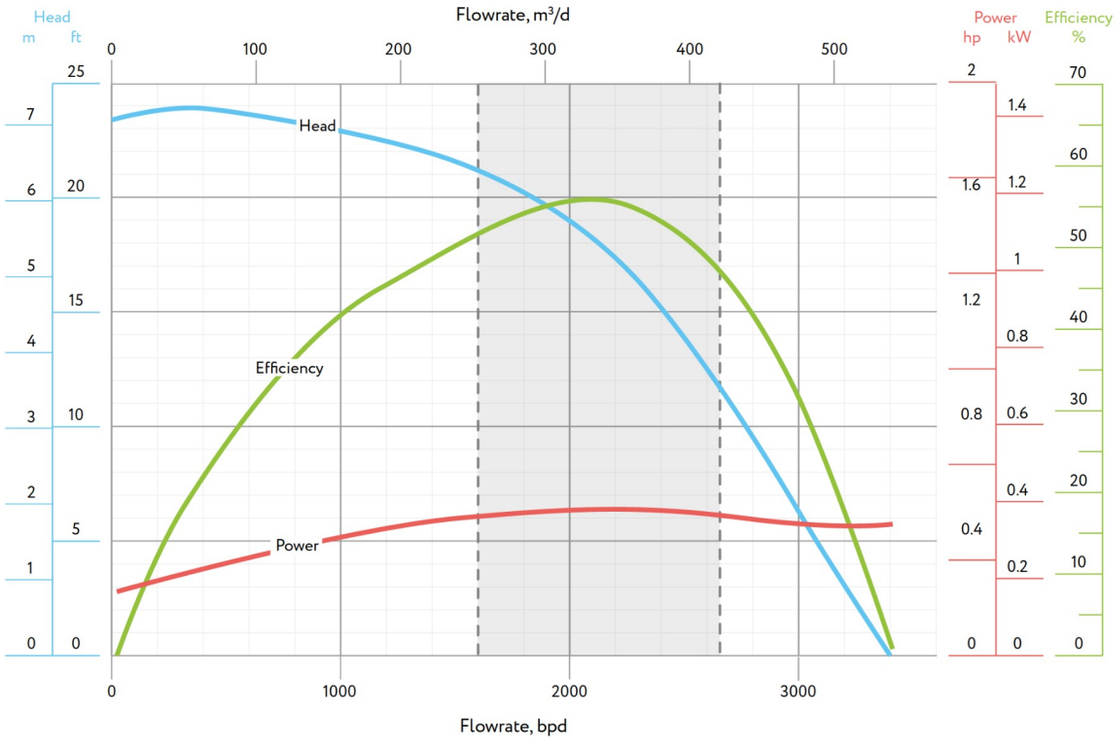
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	75	10.5	3.201	585	266
3.5M	87	12.1	3.689	669	304
4M	100	13.8	4.207	741	337
4.5M	112	15.4	4.695	823	374
5M	125	17.1	5.213	895	407
5.5M	137	18.7	5.701	979	445

ESP-OS A 362-2100

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

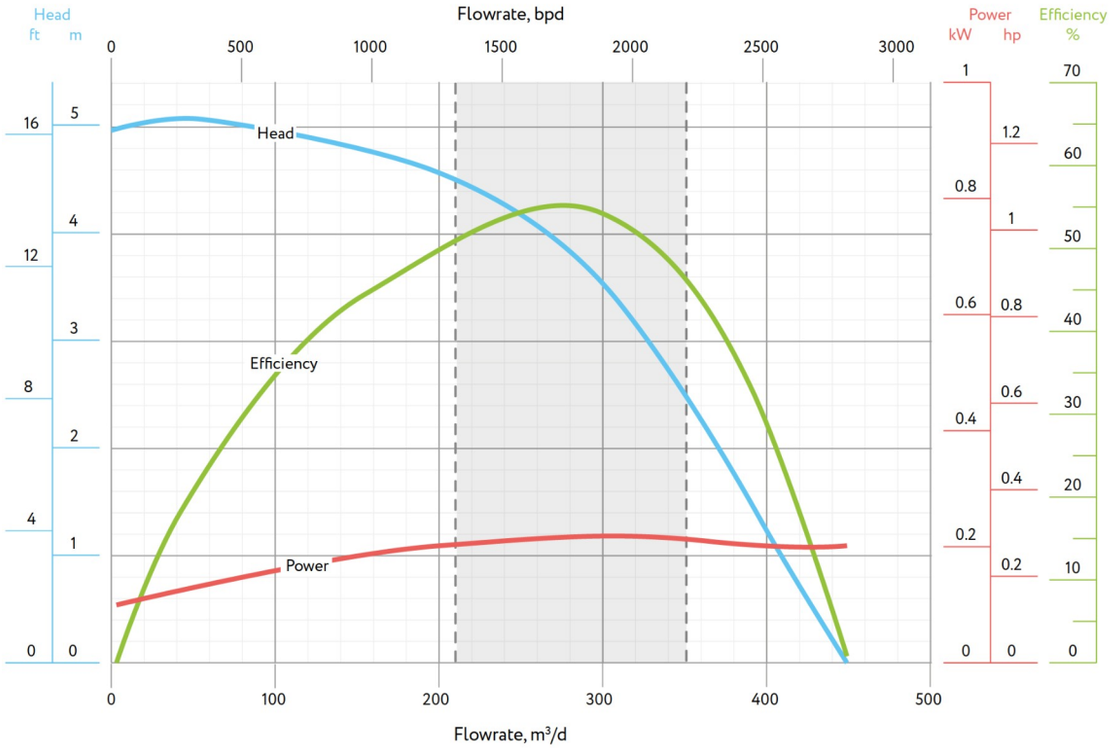
60 HZ -3,500 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		55 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	2,081 bpd	331 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	1,589 - 2,648 bpd	253 - 421 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	18.3 ft	5.6 m
Shaft limit	standard (direct start)	201 hp	150 kW		power	0.508 hp	0.378 kW
	high-strength (soft start)	387 hp	288 kW		rotational direction	CW	

362 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



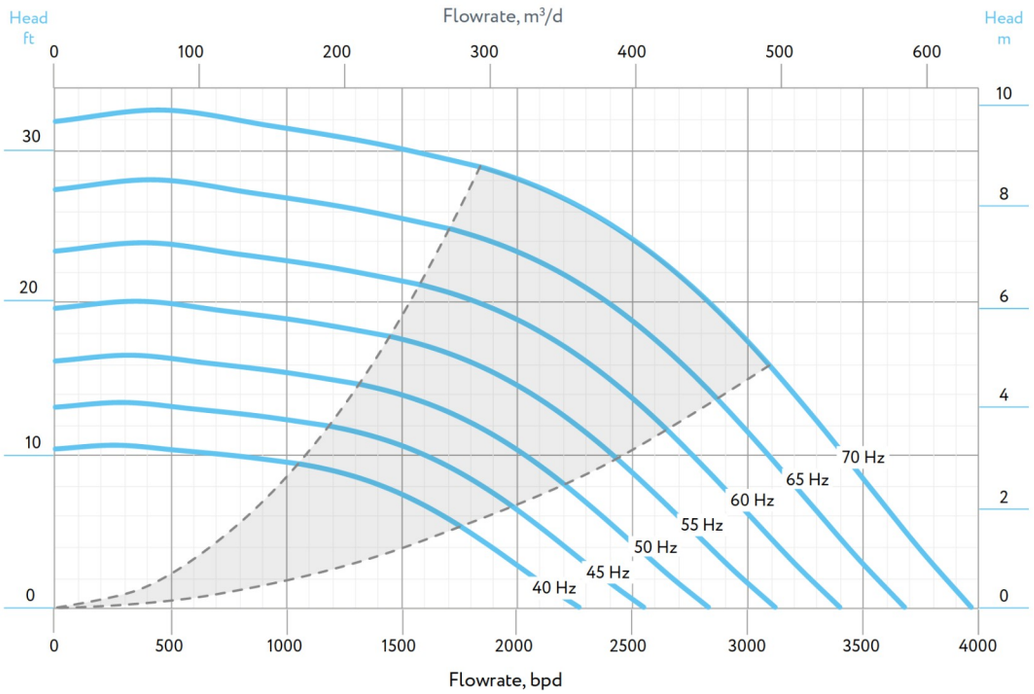
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	3.62 in.	92 mm	Best efficiency		55 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,736 bpd	276 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	1,321 - 2,201 bpd	210 - 350 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	12.8 ft	3.9 m
Shaft limit	standard (direct start)	168 hp	125 kW		power	0.294 hp	0.219 kW
	high-strength (soft start)	322 hp	240 kW		rotational direction	CW	

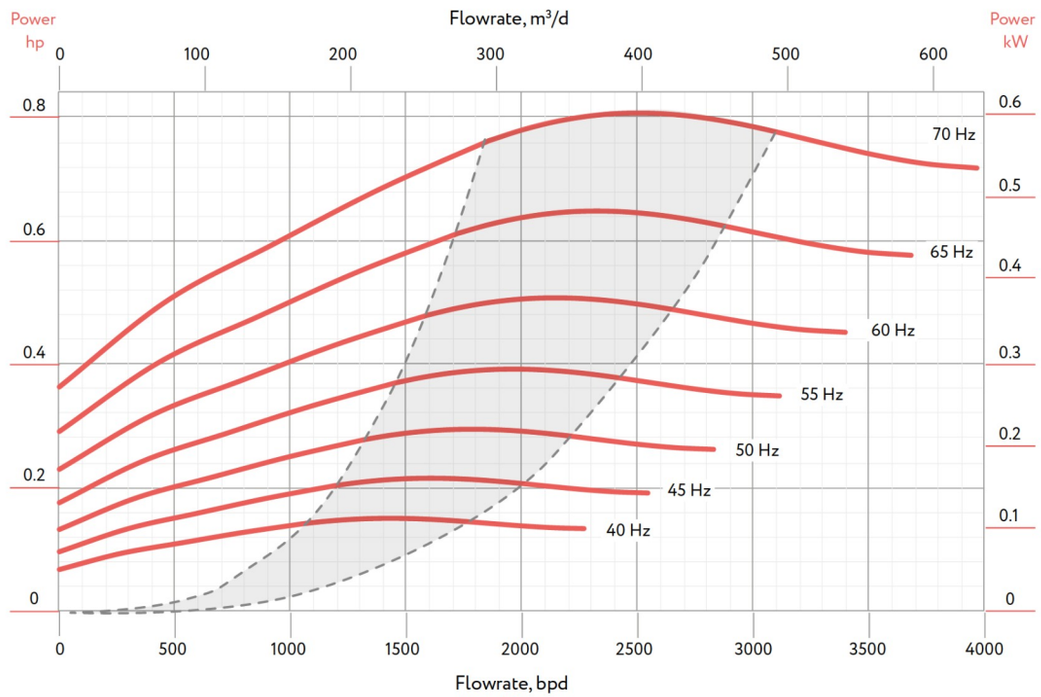
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



362 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	44	10.5	3.202	280	127
3.5M	52	12.1	3.702	318	144
4M	60	13.8	4.202	357	162
4.5M	68	15.4	4.702	393	178
5M	76	17.1	5.202	432	196
5.5M	84	18.7	5.702	470	213

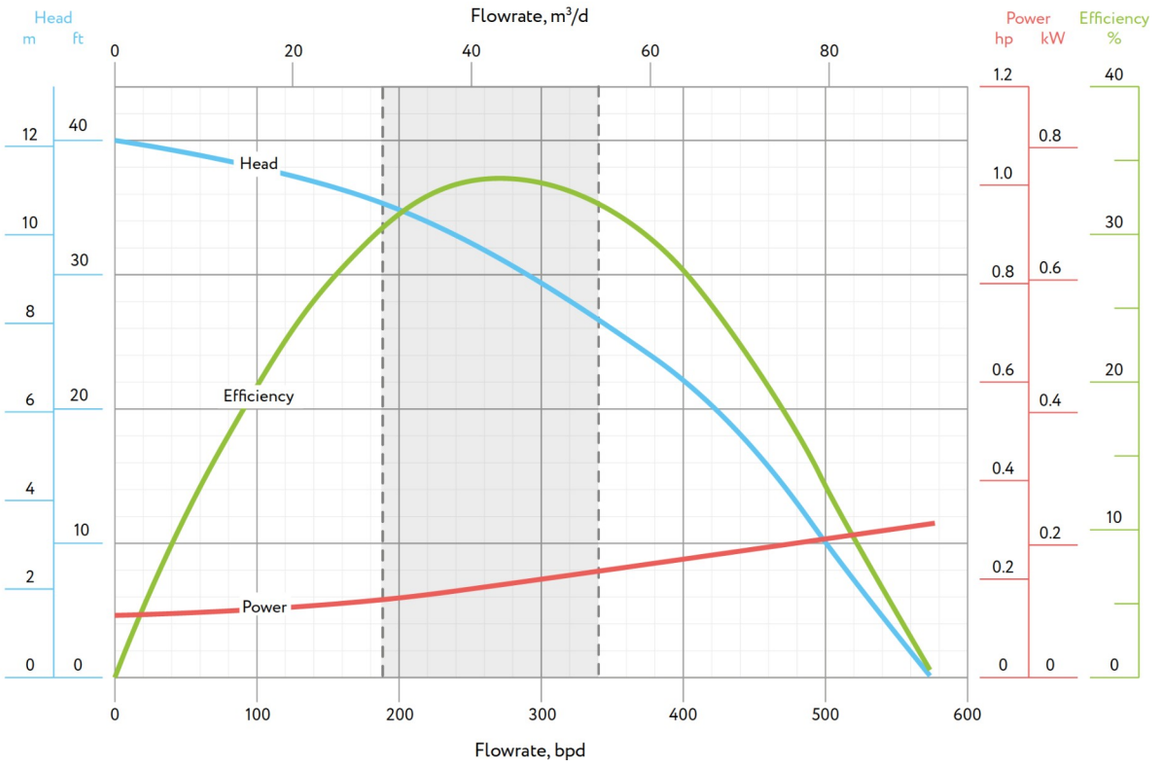
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	45	10.5	3.202	278	126
3.5M	53	12.1	3.702	316	143
4M	61	13.8	4.202	353	160
4.5M	69	15.4	4.702	391	177
5M	77	17.1	5.202	430	195
5.5M	85	18.7	5.702	468	212
6M	93	20.3	6.202	505	229

ESP-OS A 406-270

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

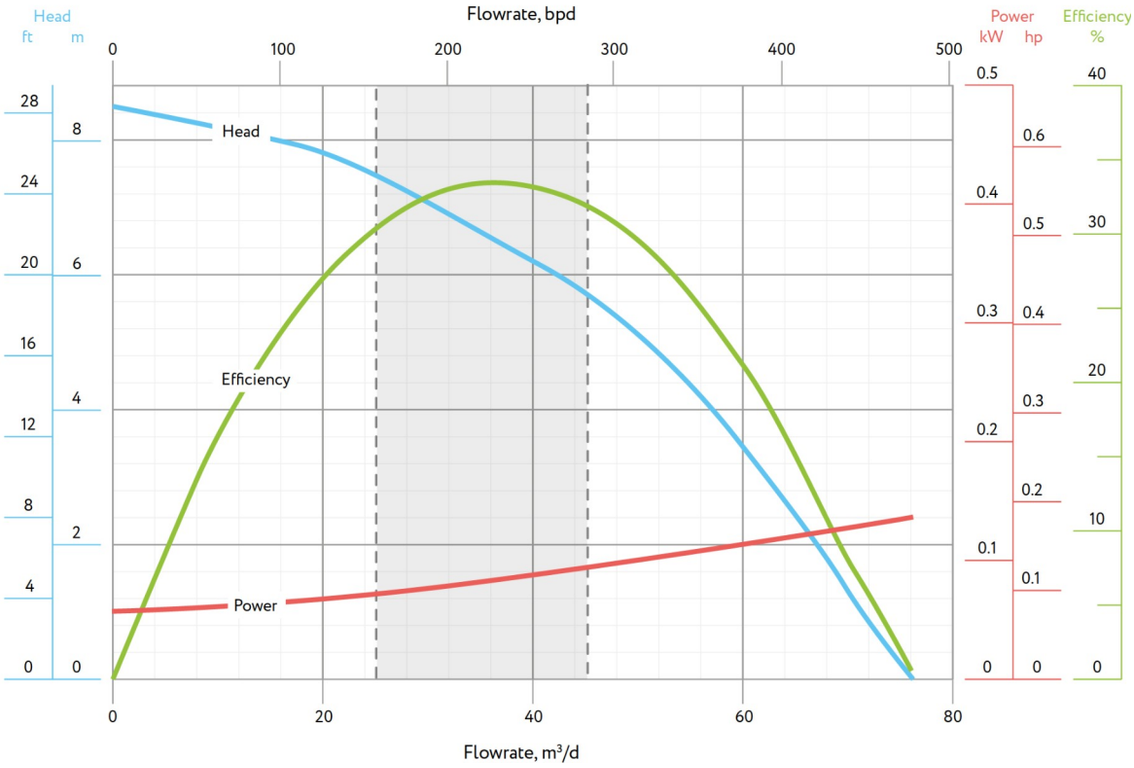
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		33.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	274 bpd	44 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	189 - 340 bpd	30 - 54 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	30.8 ft	9.4 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.186 hp	0.139 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



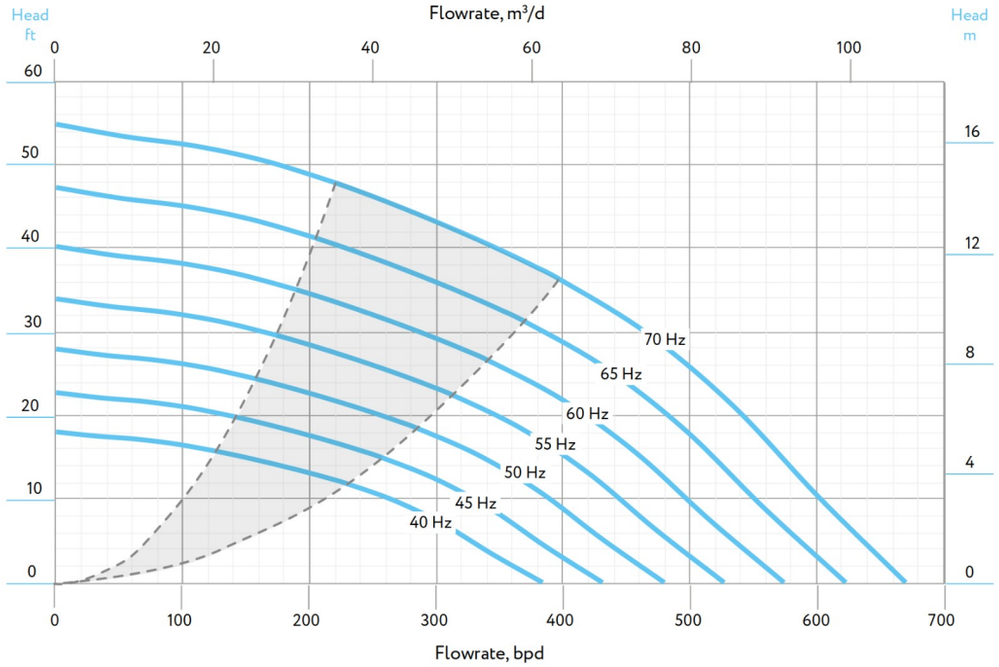
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		33.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	226 bpd	36 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	157 - 283 bpd	25 - 45 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	21.3 ft	6.5 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.107 hp	0.080 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

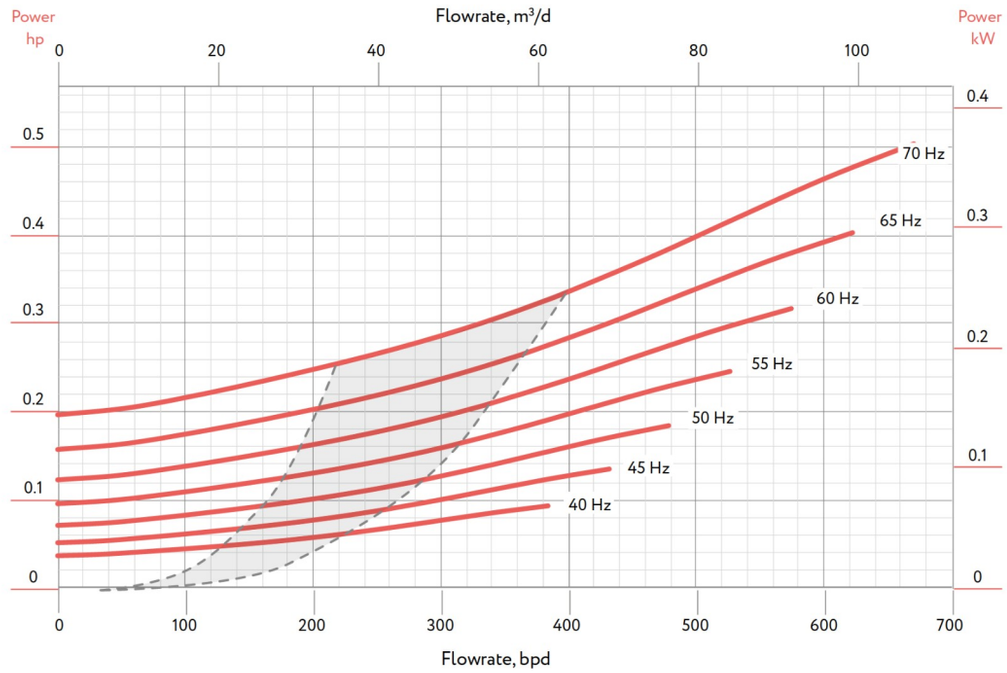
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



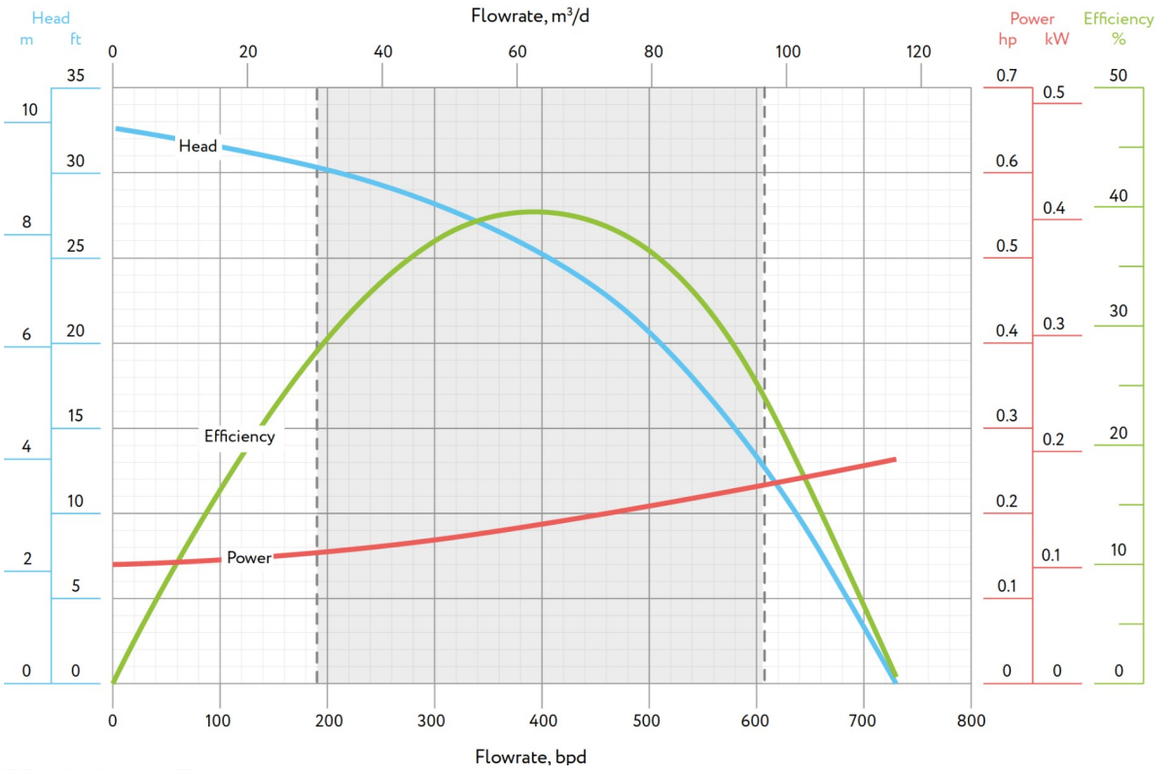
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	108	10.5	3.202	338	153
3.5M	126	12.1	3.702	382	173
4M	144	13.8	4.202	430	195
4.5M	162	15.4	4.702	474	215
5M	181	17.1	5.202	521	236
5.5M	199	18.7	5.702	565	256

ESP-OS A 406-400

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

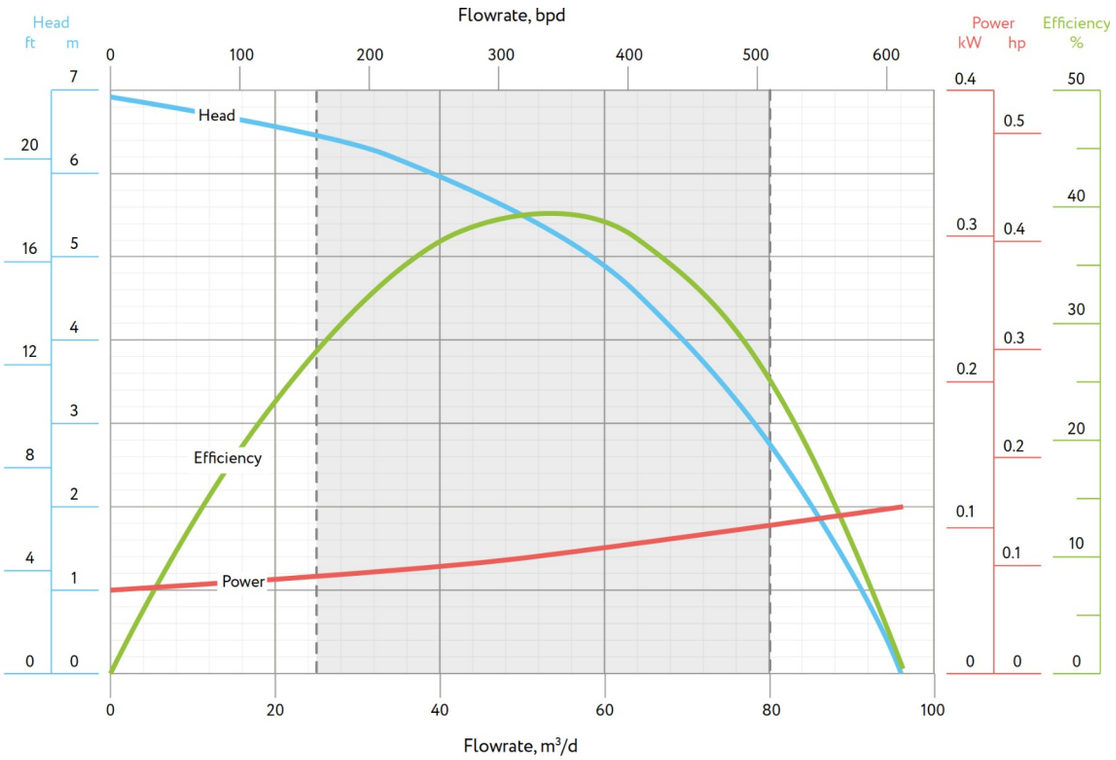
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		39.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	394 bpd	63 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	189 - 605 bpd	30 - 96 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	25.3 ft	7.7 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.186 hp	0.139 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



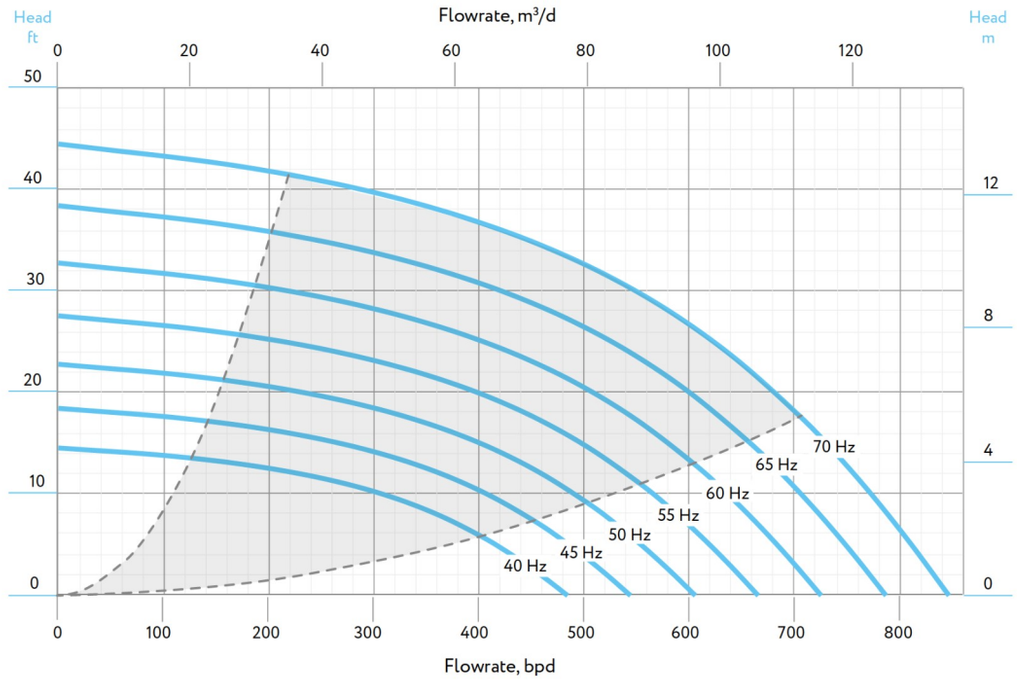
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		39.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	327 bpd	52 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	157 - 503 bpd	25 - 80 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	17.7 ft	5.4 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.107 hp	0.080 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

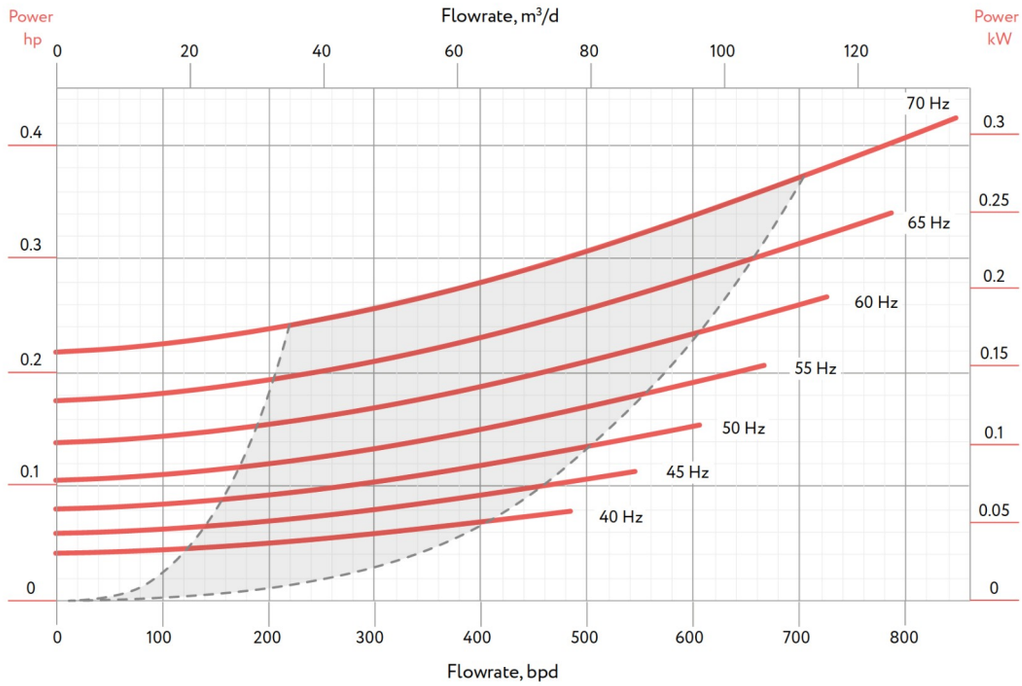
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



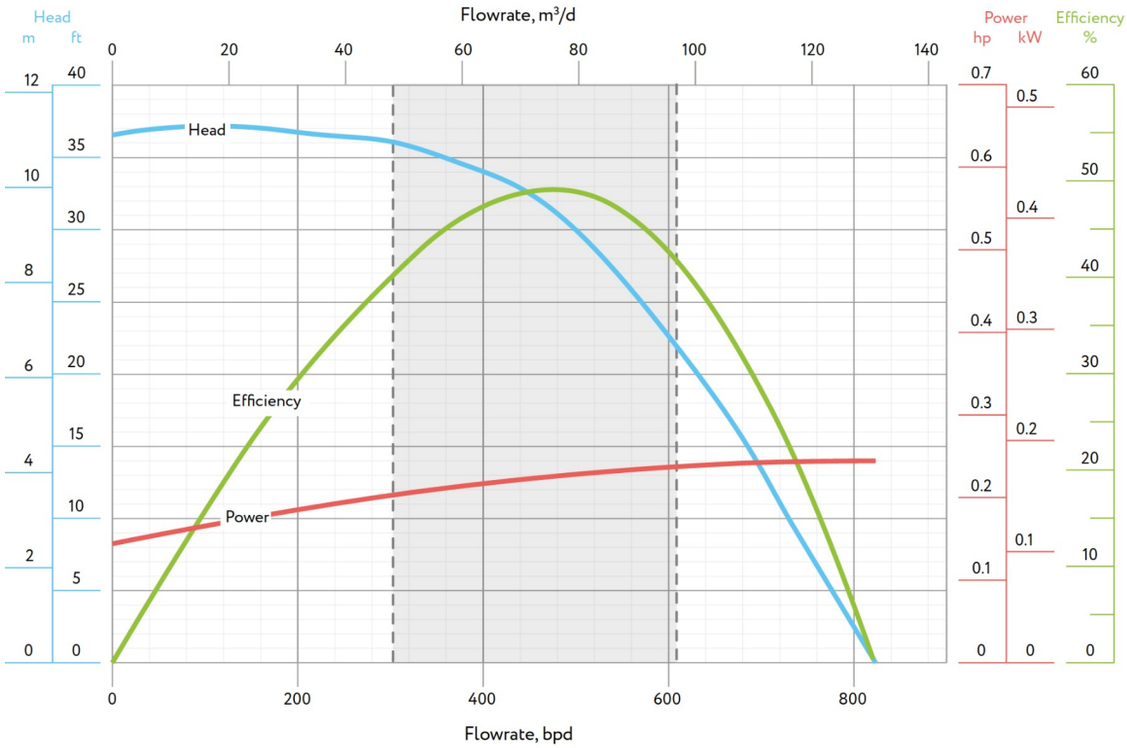
PACKET PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	108	10.5	3.202	337	153
3.5M	126	12.1	3.702	381	173
4M	144	13.8	4.202	430	195
4.5M	162	15.4	4.702	474	215
5M	181	17.1	5.202	520	236
5.5M	199	18.7	5.702	564	256

ESP-OS A 406-450

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

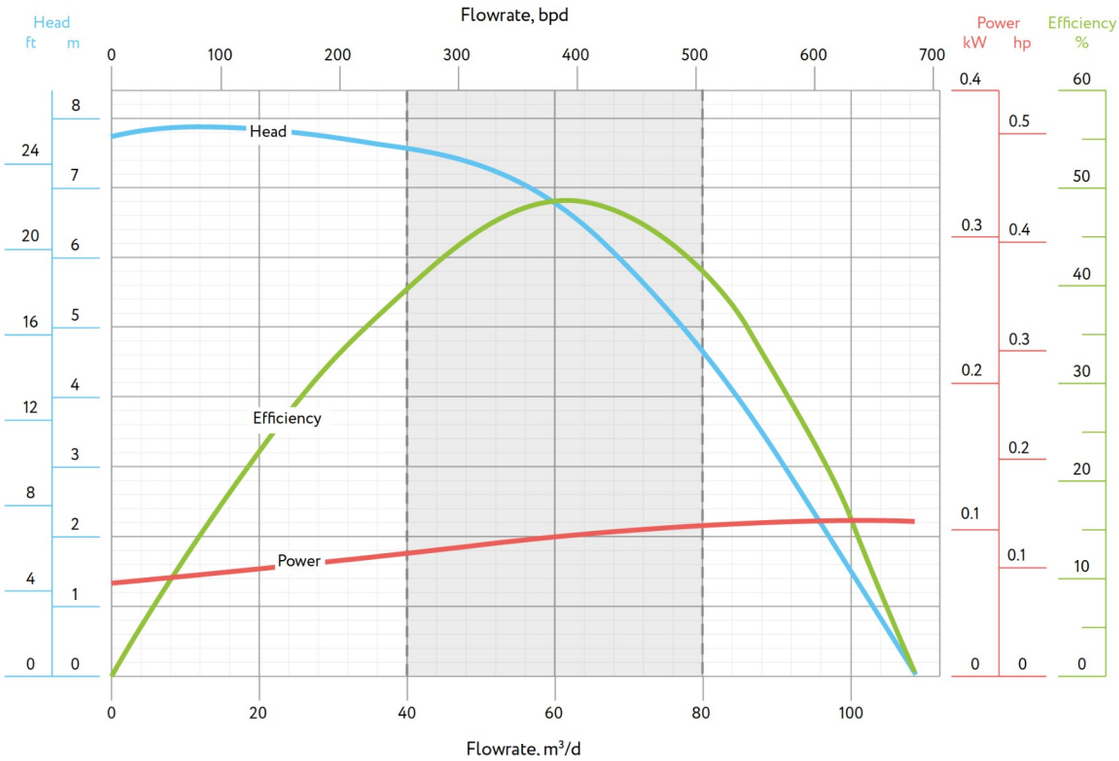
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		49 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	469 bpd	75 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	303 - 605 bpd	48 - 96 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	31.2 ft	9.5 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.221 hp	0.165 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



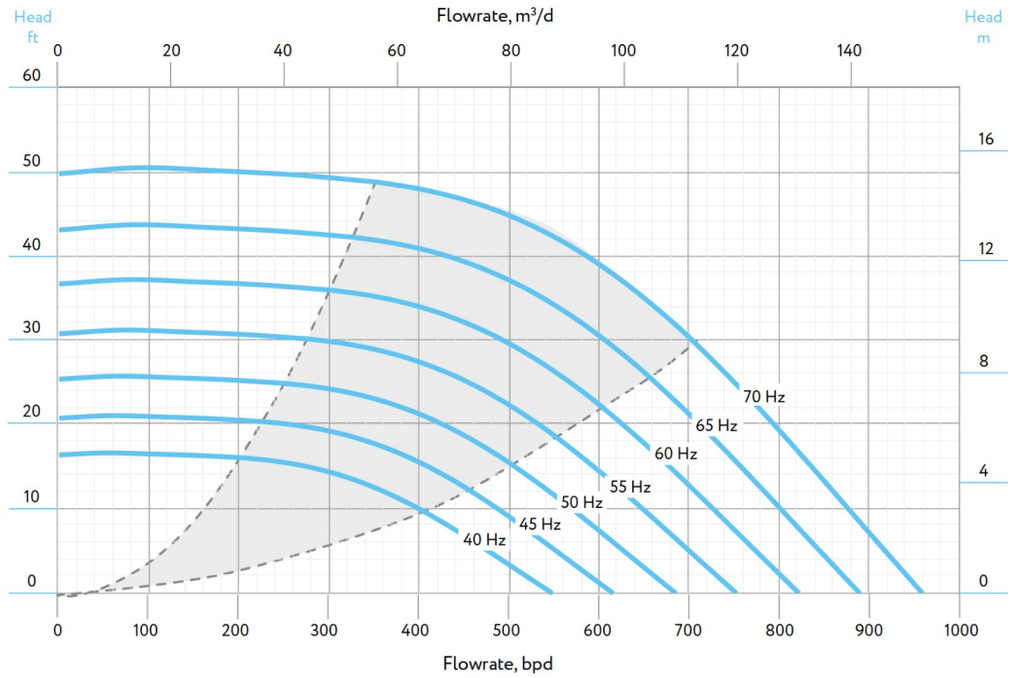
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		49 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	390 bpd	62 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	252 - 503 bpd	40 - 80 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	21.7 ft	6.6 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.128 hp	0.095 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

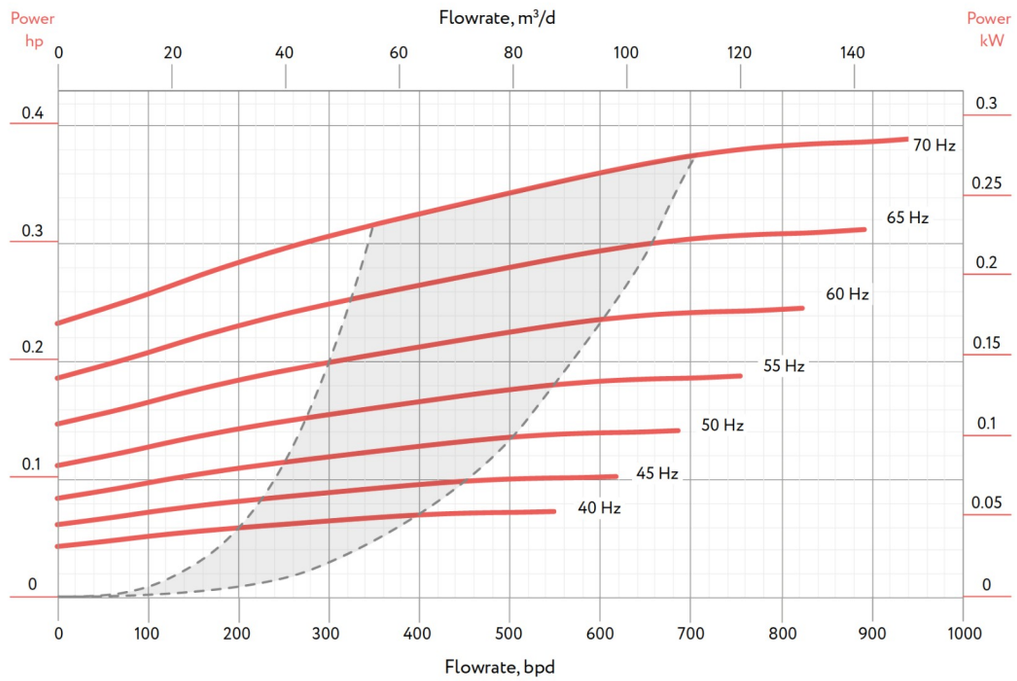
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	27	3.9	1.202	144	65
2M	59	7.2	2.202	234	106
2.5M	74	8.9	2.702	278	126

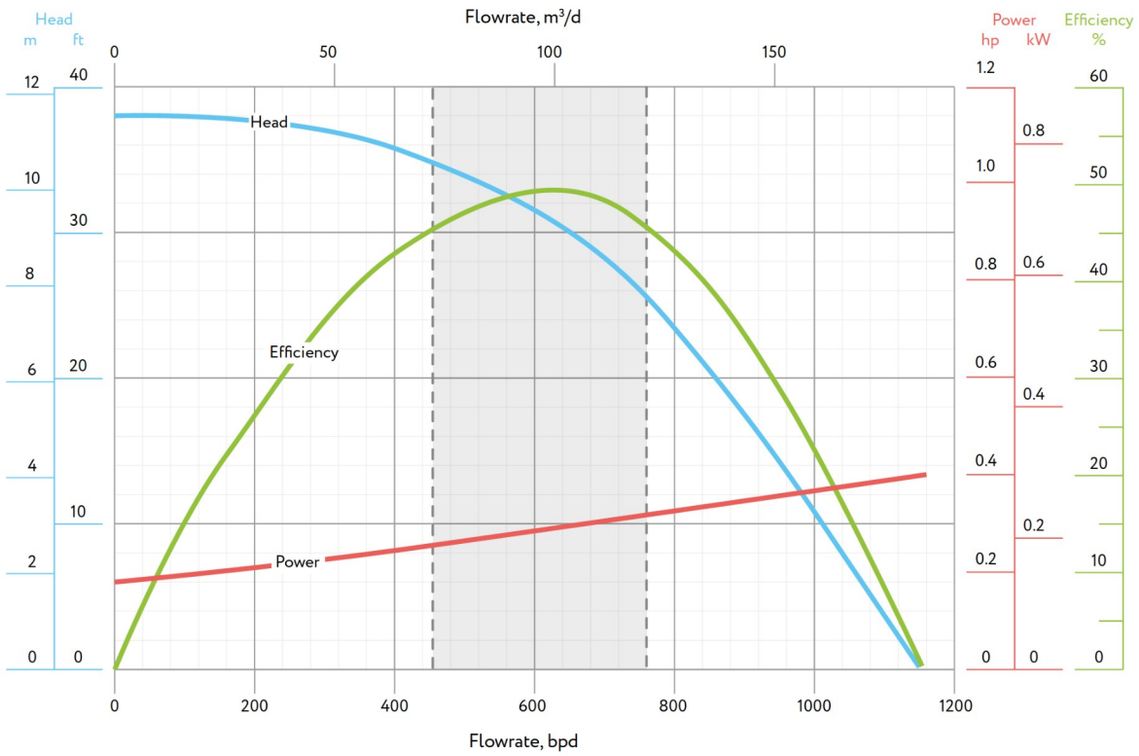
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	101	10.5	3.202	338	153
3.5M	118	12.1	3.702	382	173
4M	136	13.8	4.202	430	195
4.5M	153	15.4	4.702	474	215
5M	171	17.1	5.202	521	236
5.5M	188	18.7	5.702	565	256

ESP-OS A 406-600

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

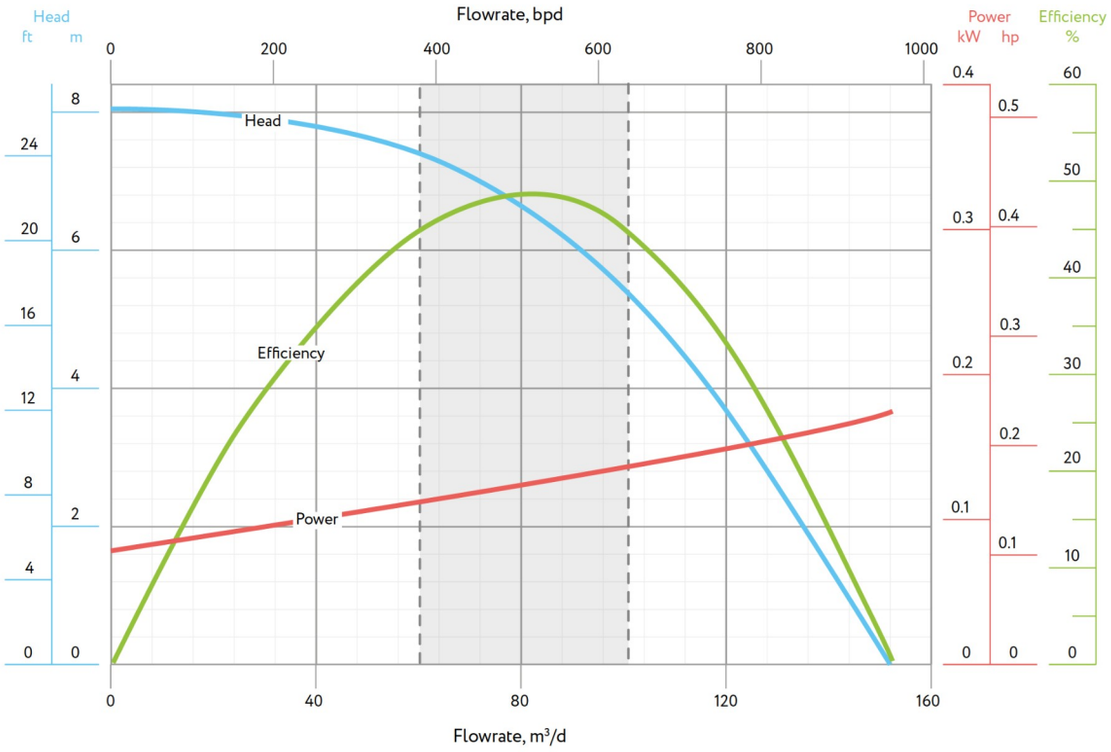
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		49 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	608 bpd	97 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	454 - 756 bpd	72 - 120 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	31.2 ft	9.5 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.287 hp	0.214 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



TECHNICAL DATA

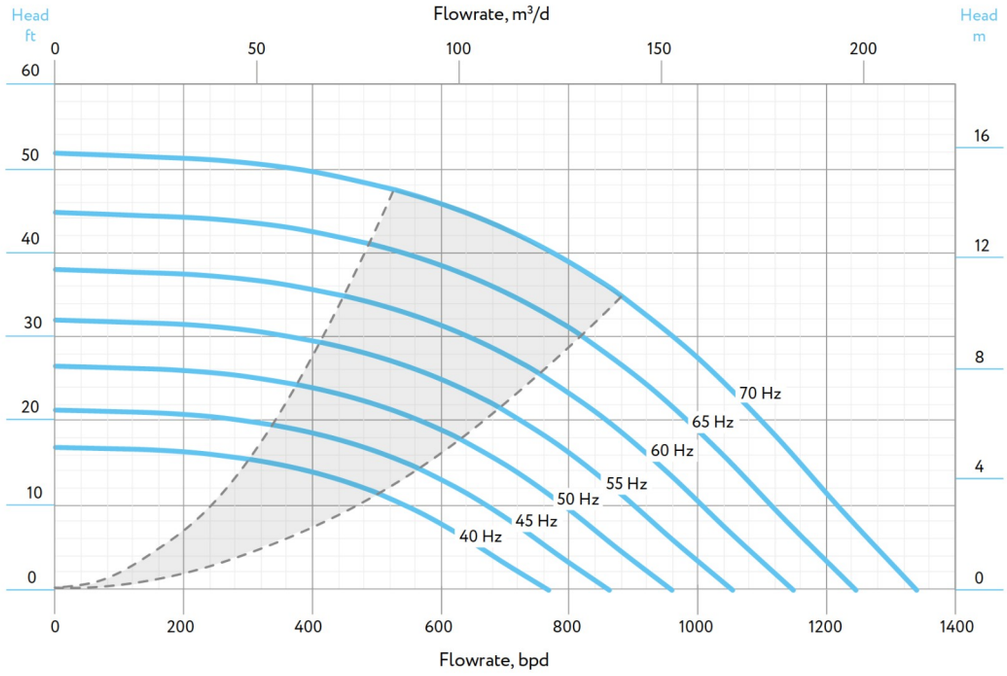
50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		49 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	509 bpd	81 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	377 - 629 bpd	60 - 100 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	21.7 ft	6.6 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.166 hp	0.124 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

quality integrity innovations

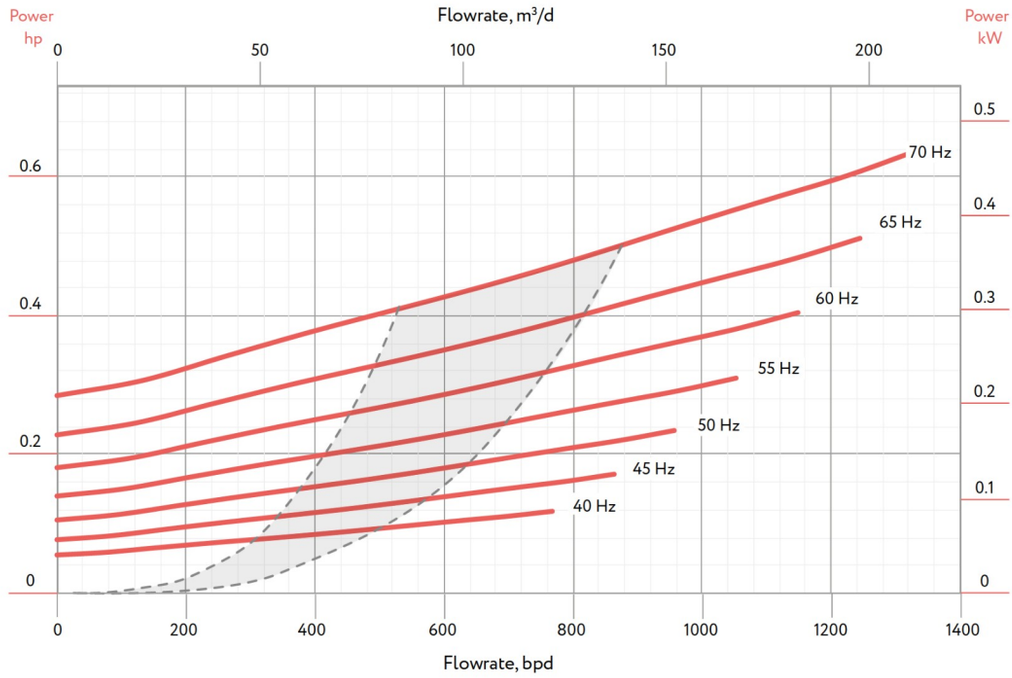
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



quality integrity innovations

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	29	3.9	1.202	144	64
2M	64	7.2	2.202	231	105
2.5M	84	8.9	2.702	275	125

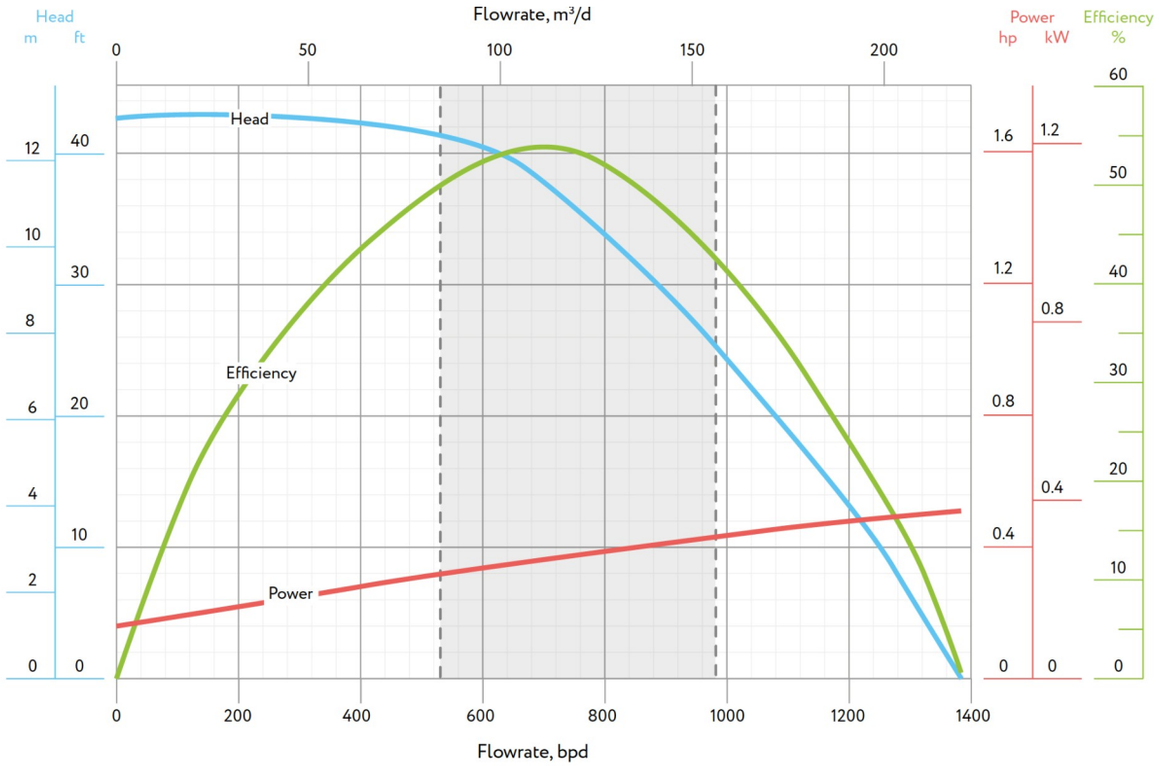
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	103	10.5	3.202	338	153
3.5M	121	12.1	3.702	379	172
4M	138	13.8	4.202	430	195
4.5M	156	15.4	4.702	472	214
5M	173	17.1	5.202	521	236
5.5M	191	18.7	5.702	562	255

ESP-OS A 406-700

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

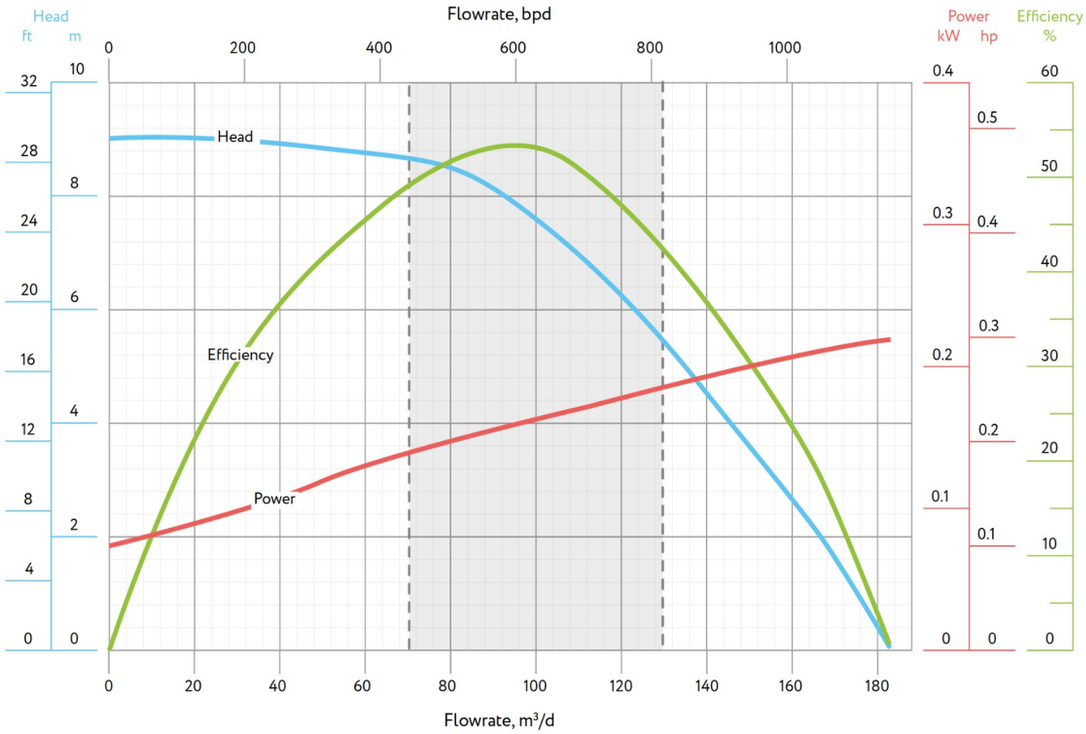
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		53 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	698 bpd	111 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	530 - 983 bpd	84 - 156 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	37.9 ft	11.55 m
Shaft limit	standard (direct start)	129 hp	96 kW		power	0.365 hp	0.272 kW
	high-strength (soft start)	251 hp	187 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



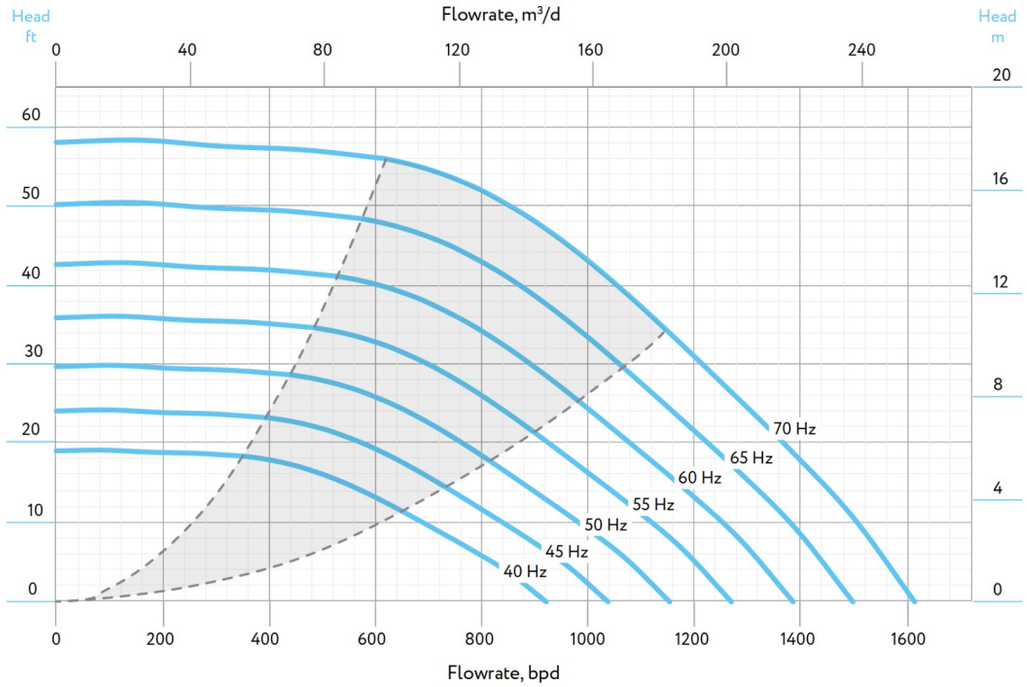
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		53 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	579 bpd	92 m^3/d
Shaft	diameter	0.669 in.	17.0 mm		recommended operating range	440 - 818 bpd	70 - 130 m^3/d
	shaft cross-sectional area	0.352 $in.^2$	226.98 mm^2	**Stage**	head	26.2 ft	8.0 m
Shaft limit	standard (direct start)	107 hp	80 kW		power	0.212 hp	0.158 kW
	high-strength (soft start)	209 hp	156 kW		rotational direction	CW	

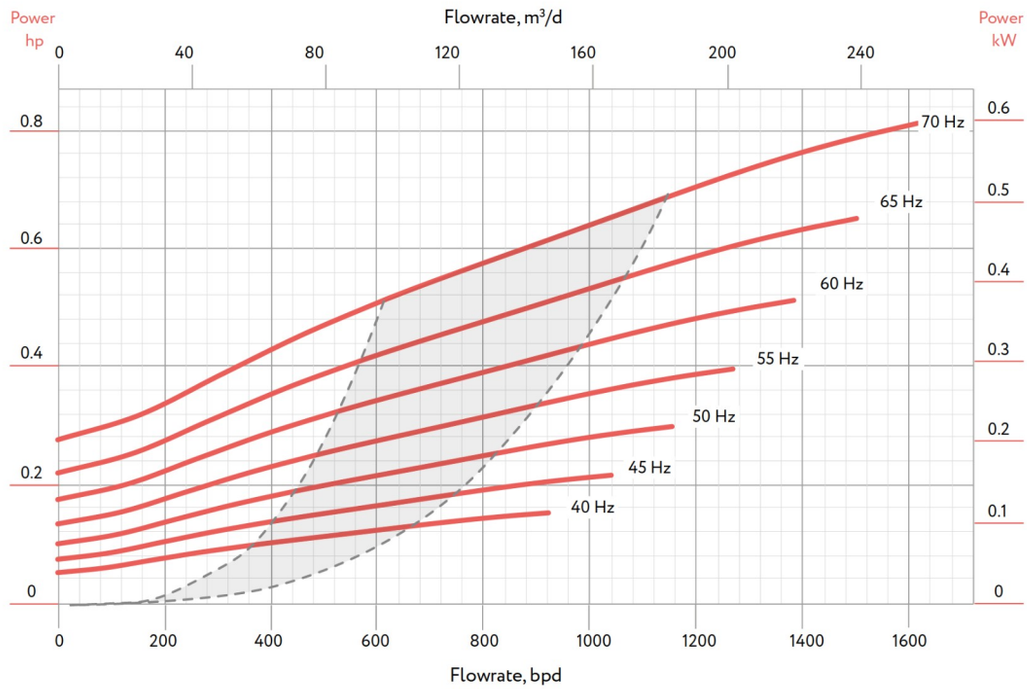
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	26	3.9	1.202	144	65
2M	57	7.2	2.202	234	106
3M	90	10.5	3.202	278	126

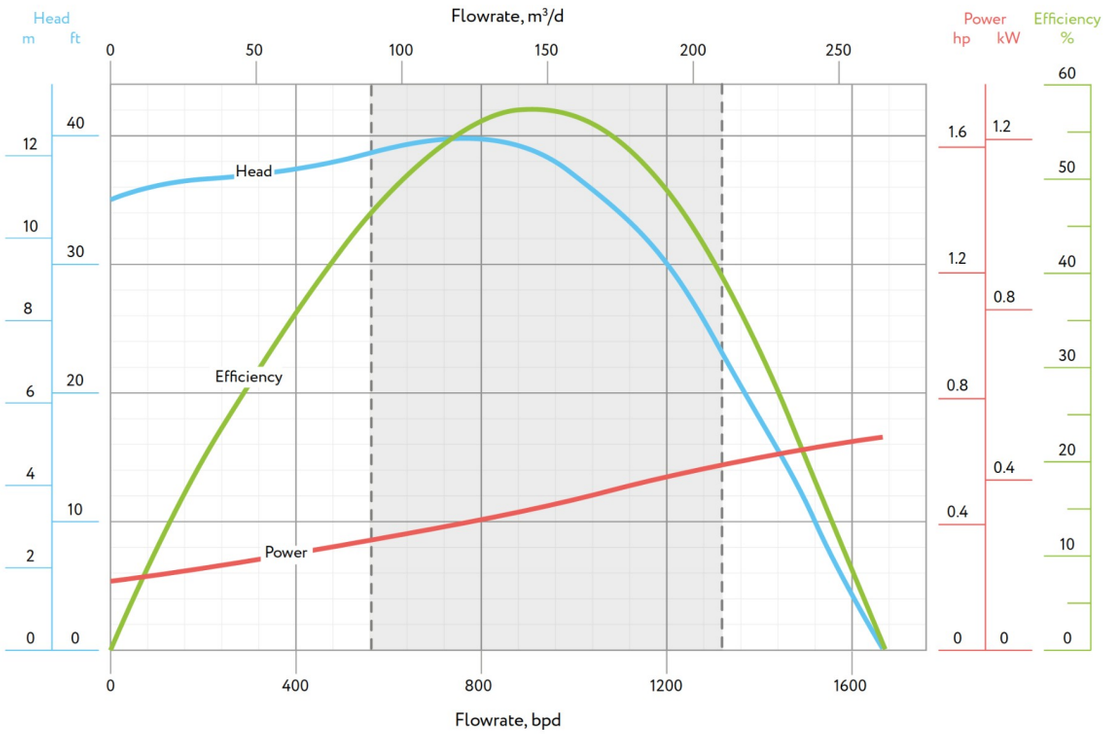
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	99	10.5	3.202	338	153
3.5M	116	12.1	3.702	379	172
4M	132	13.8	4.202	430	195
4.5M	149	15.4	4.702	472	214
5M	166	17.1	5.202	521	236
5.5M	183	18.7	5.702	562	255

ESP-OS A 406-900

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

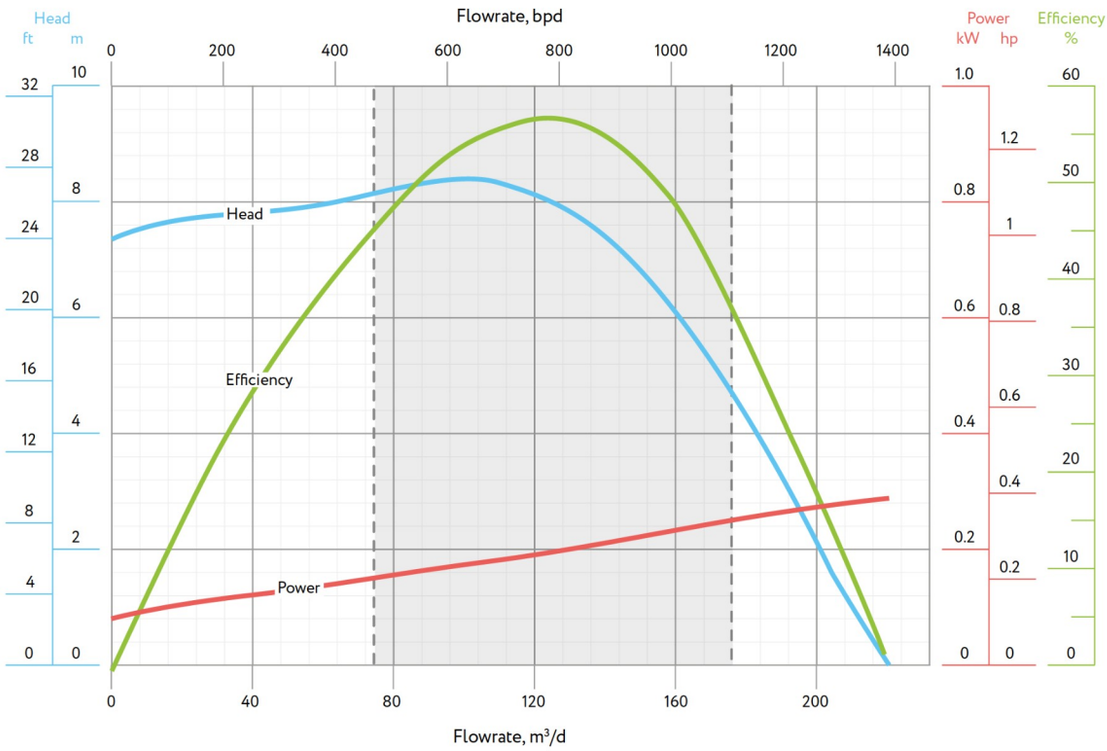
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		57 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	927 bpd	147 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	567 - 1,324 bpd	90 - 210 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	38.5 ft	11.7 m
Shaft limit	standard (direct start)	201 hp	150 kW		power	0.463 hp	0.345 kW
	high-strength (soft start)	387 hp	288 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



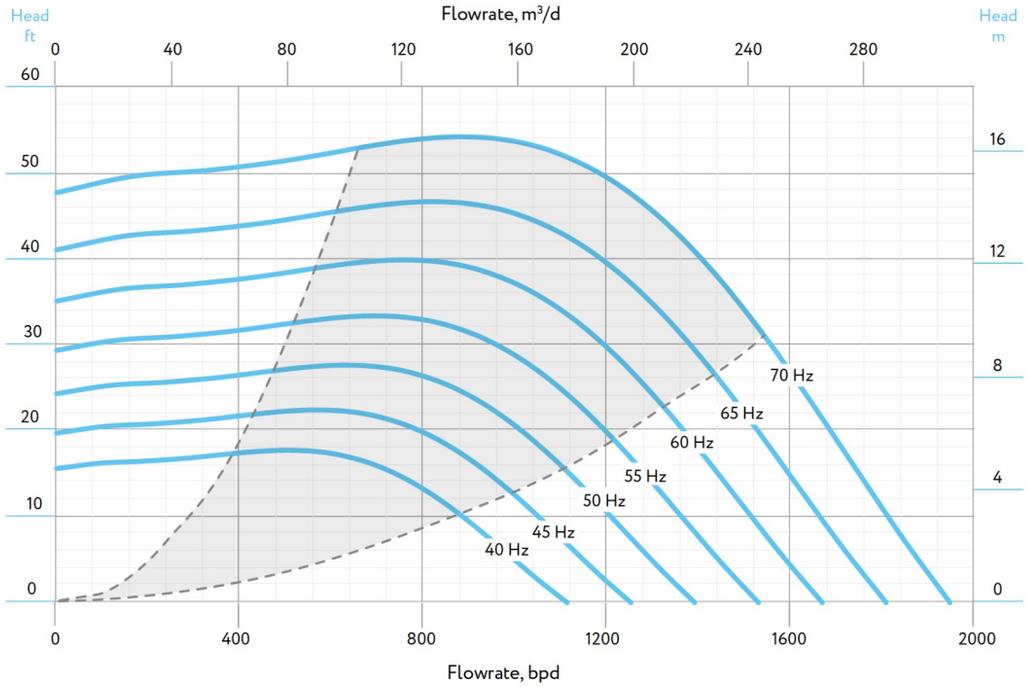
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		57 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	774 bpd	123 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	472 - 1,001 bpd	75 - 175 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	26.9 ft	8.2 m
Shaft limit	standard (direct start)	168 hp	125 kW		power	0.268 hp	0.200 kW
	high-strength (soft start)	322 hp	240 kW		rotational direction	CW	

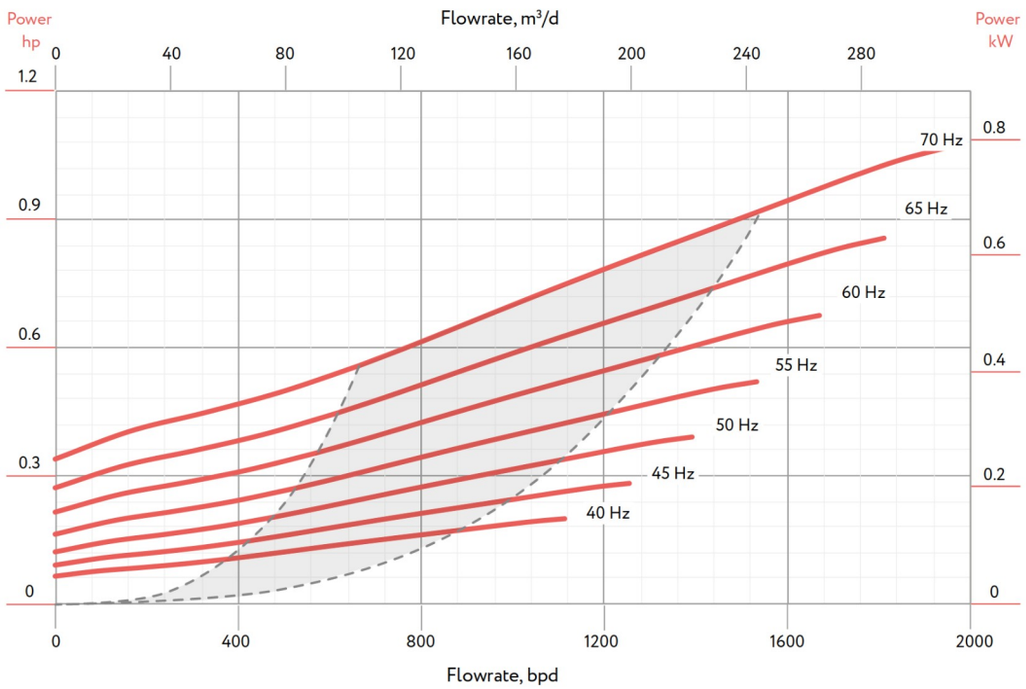
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



quality integrity innovations

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	24	3.9	1.202	144	65
2M	52	7.2	2.202	234	106
3M	83	10.5	3.202	318	144

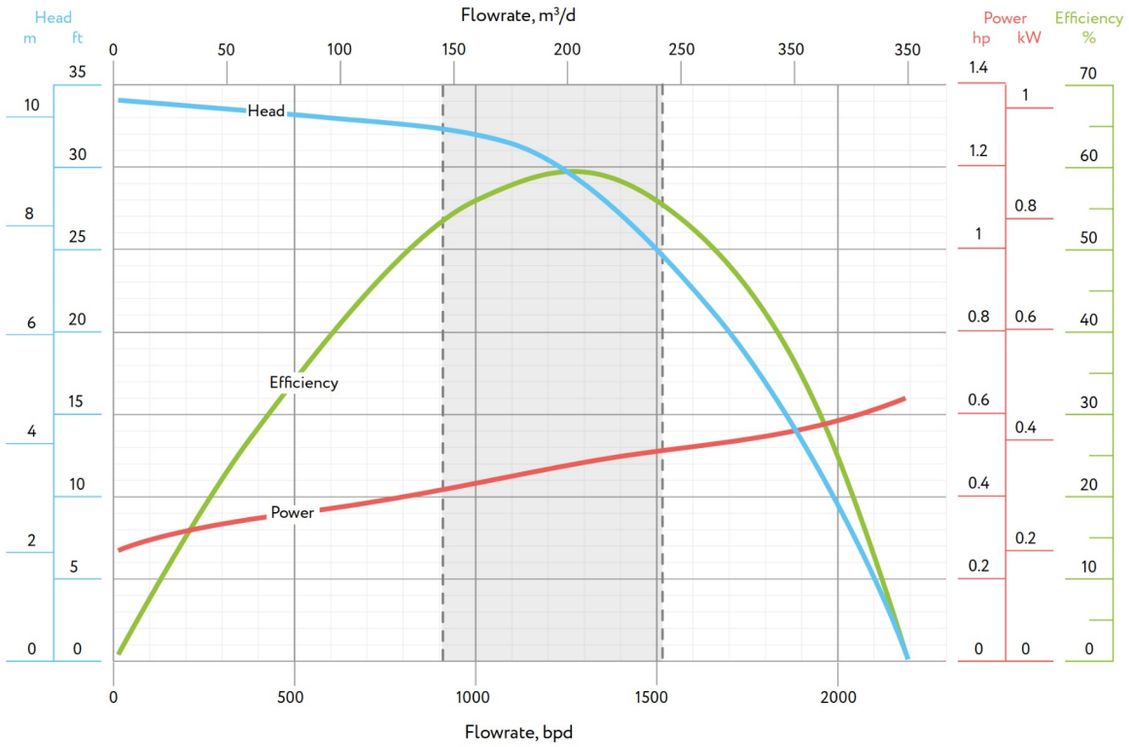
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	92	10.5	3.202	338	153
3.5M	107	12.1	3.702	379	172
4M	123	13.8	4.202	430	195
4.5M	138	15.4	4.702	472	214
5M	154	17.1	5.202	521	236
5.5M	169	18.7	5.702	562	255

ESP-OS A 406-1250

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

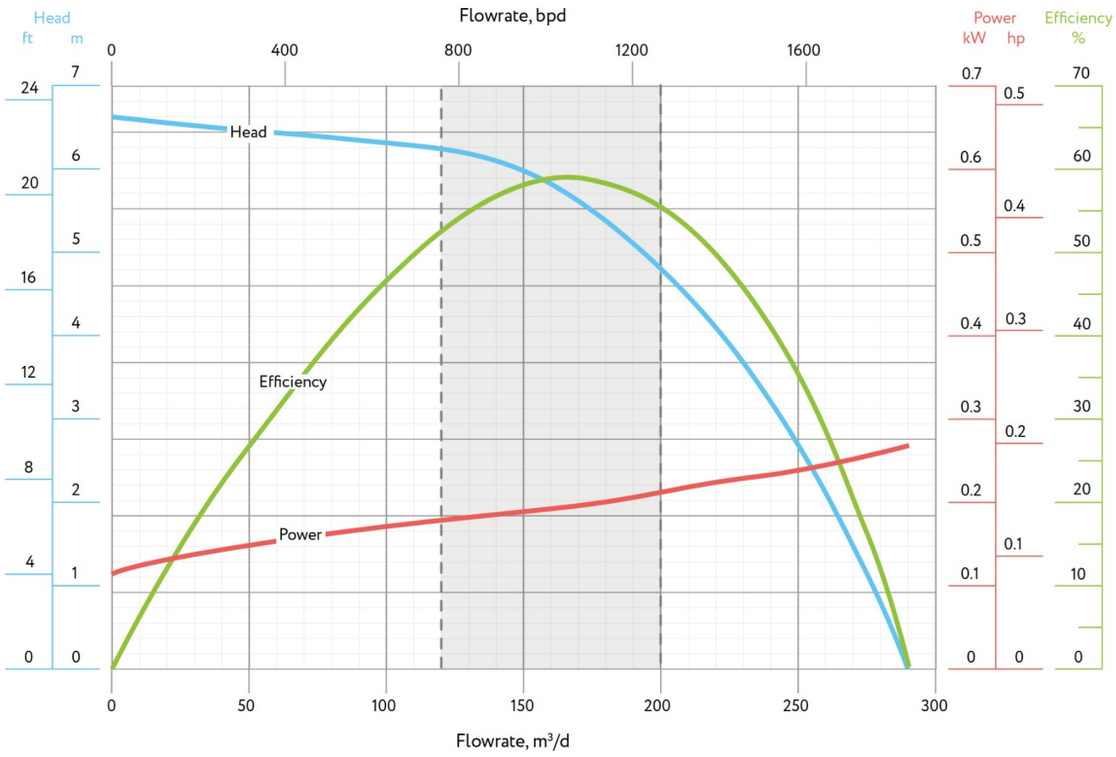
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		59 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,255 bpd	200 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	908 - 1,513 bpd	144 - 241 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	29.4 ft	9.0 m
Shaft limit	standard (direct start)	201 hp	150 kW		power	0.461 hp	0.343 kW
	high-strength (soft start)	387 hp	288 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



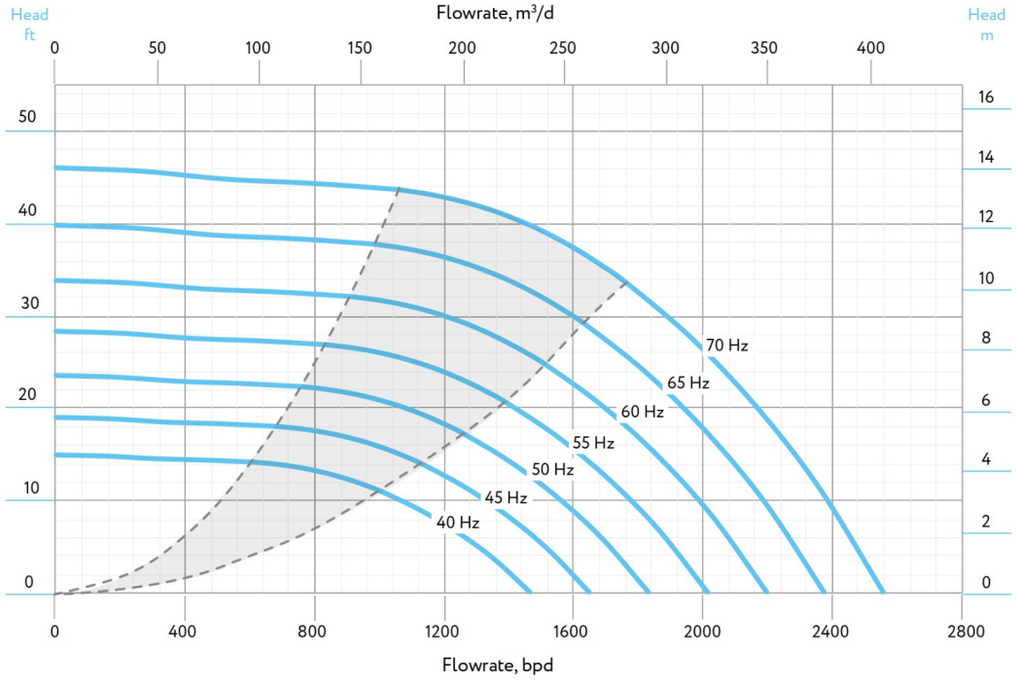
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		59 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,044 bpd	166 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	755 - 1,258 bpd	120 - 200 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	20.3 ft	6.2 m
Shaft limit	standard (direct start)	168 hp	125 kW		power	0.267 hp	0.199 kW
	high-strength (soft start)	322 hp	240 kW		rotational direction	CW	

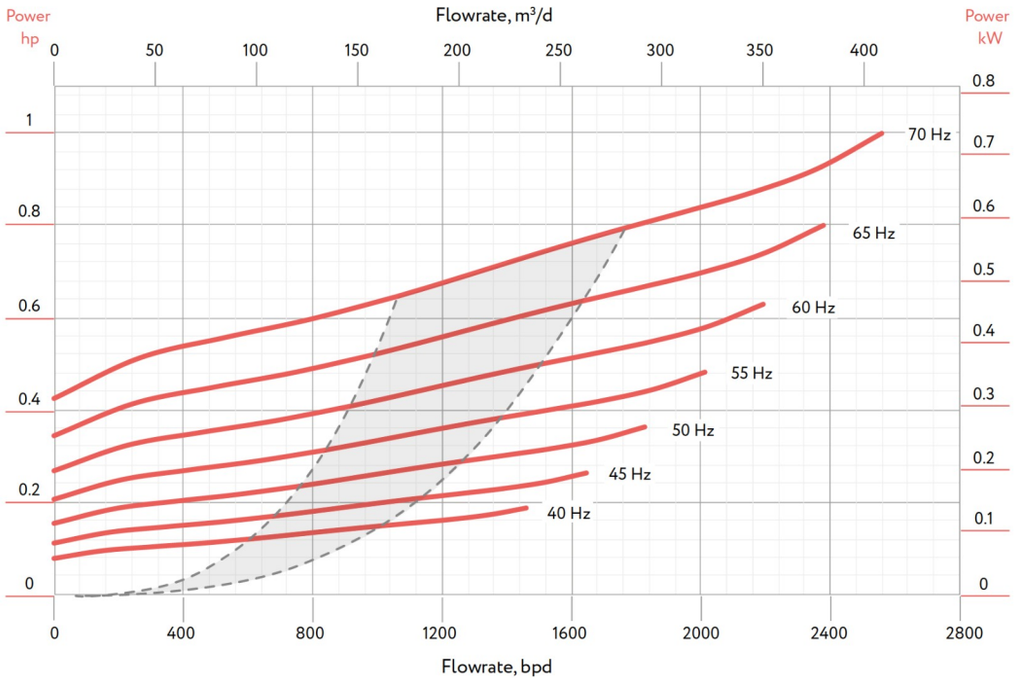
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



406 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	24	3.9	1.202	144	65
2M	52	7.2	2.202	234	106
3M	83	10.5	3.202	318	144

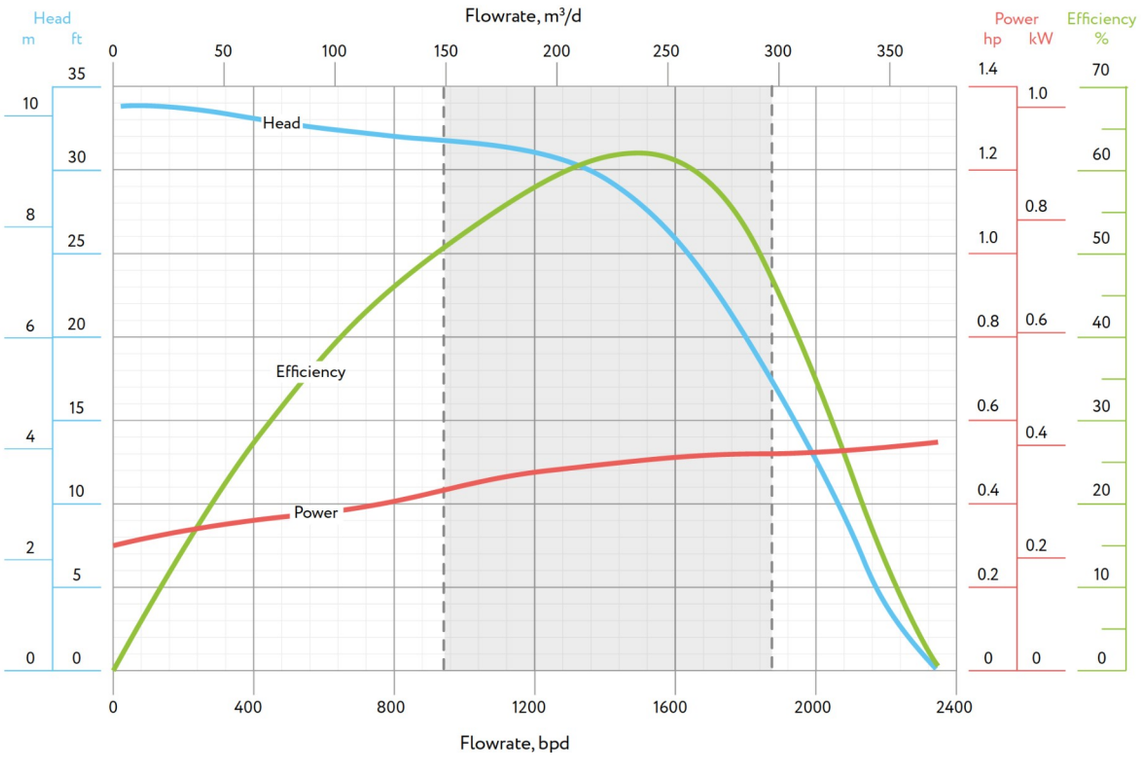
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	89	10.5	3.202	311	141
3.5M	105	12.1	3.702	353	160
4M	120	13.8	4.202	397	180
4.5M	136	15.4	4.702	439	199
5M	151	17.1	5.202	481	218
5.5M	166	18.7	5.702	518	235

ESP-OS A 406-1500

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

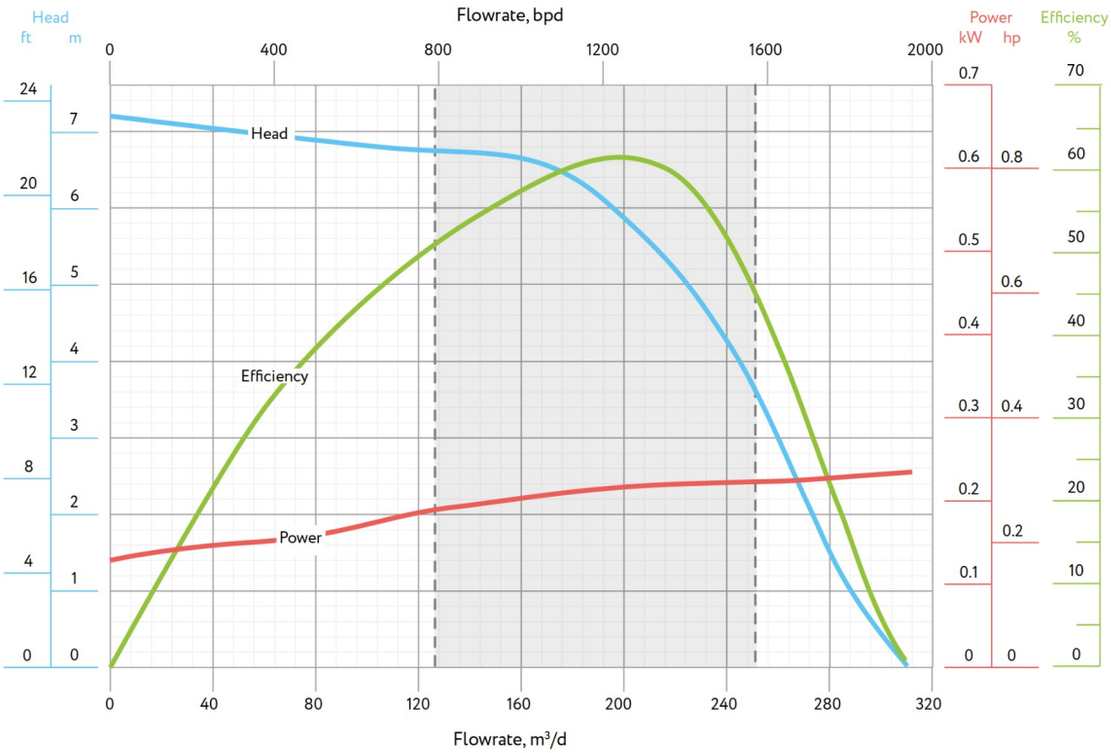
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		62 %	
	housing pressure limit	6,000 psi	465 bar	Pump	optimum flow rate	1,479 bpd	235 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	946 - 1,891 bpd	150 - 301 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	Stage	head	28.5 ft	8.7 m
Shaft limit	standard (direct start)	201 hp	150 kW		power	0.502 hp	0.374 kW
	high-strength (soft start)	387 hp	288 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



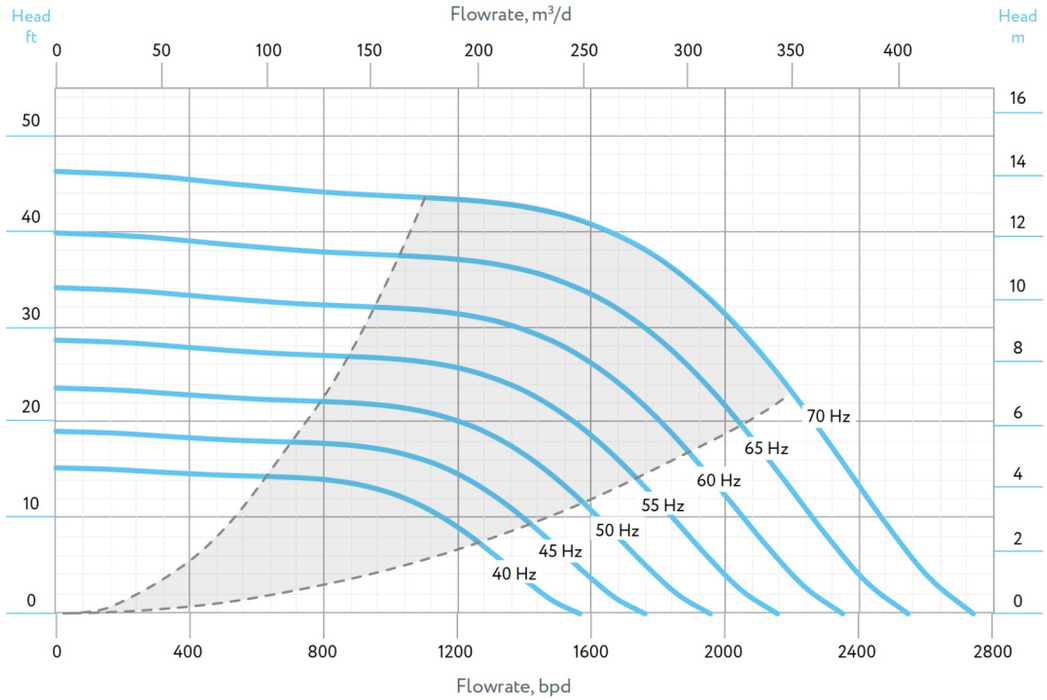
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		62 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,233 bpd	196 m^3/d
Shaft	diameter	0.787 in.	20.0 mm		recommended operating range	786 - 1,572 bpd	125 - 250 m^3/d
	shaft cross-sectional area	0.487 $in.^2$	314.16 mm^2	**Stage**	head	19.7 ft	6.0 m
Shaft limit	standard (direct start)	168 hp	125 kW		power	0.291 hp	0.217 kW
	high-strength (soft start)	322 hp	240 kW		rotational direction	CW	

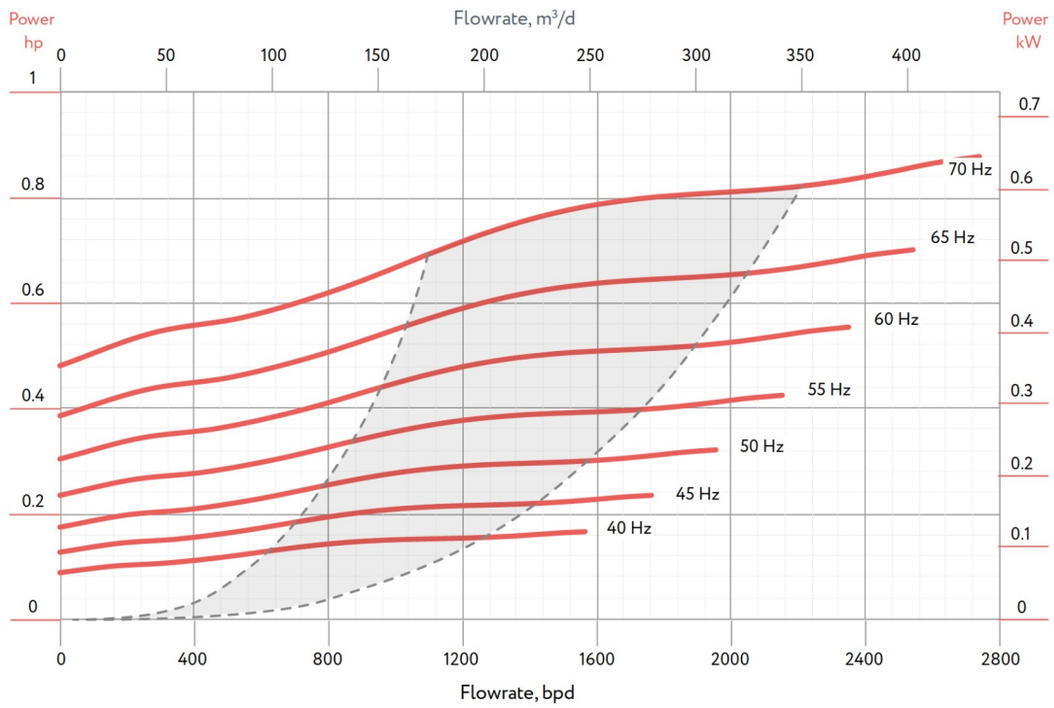
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



406 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	24	3.9	1.202	144	65
2M	52	7.2	2.202	234	106
3M	83	10.5	3.202	318	144

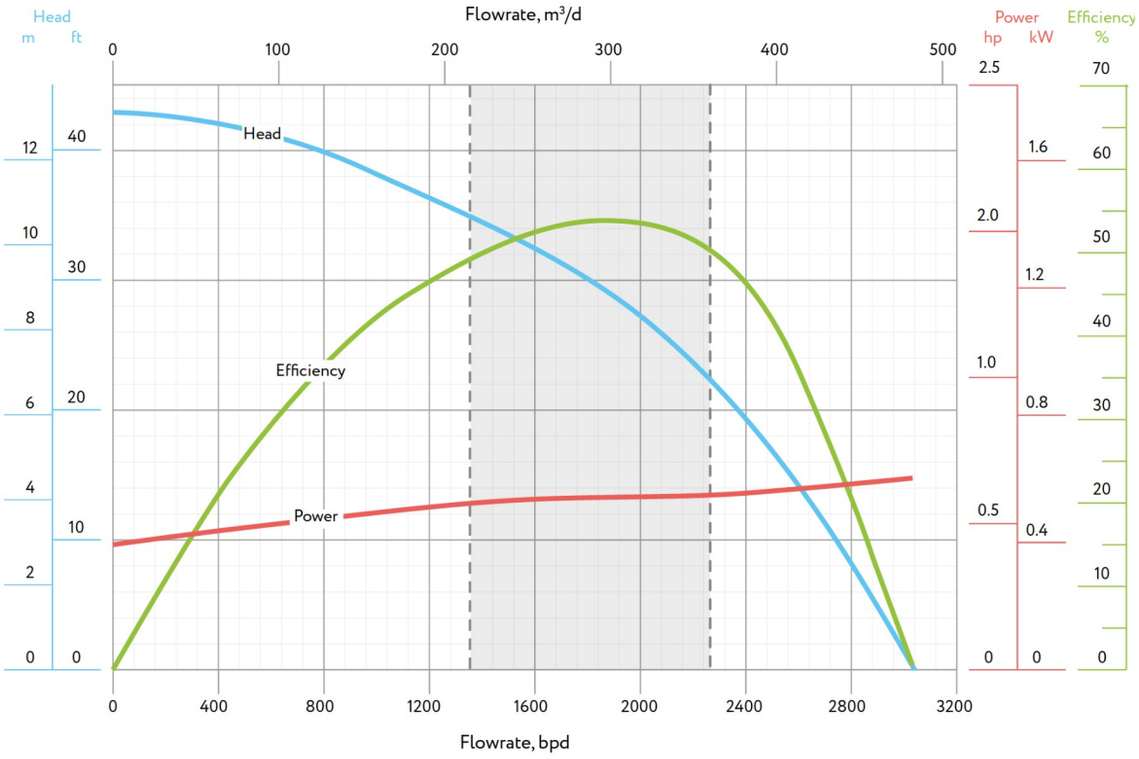
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	92	10.5	3.202	338	153
4M	122	13.8	4.202	430	195
5M	153	17.1	5.202	521	236

ESP-OS A 406-1900

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

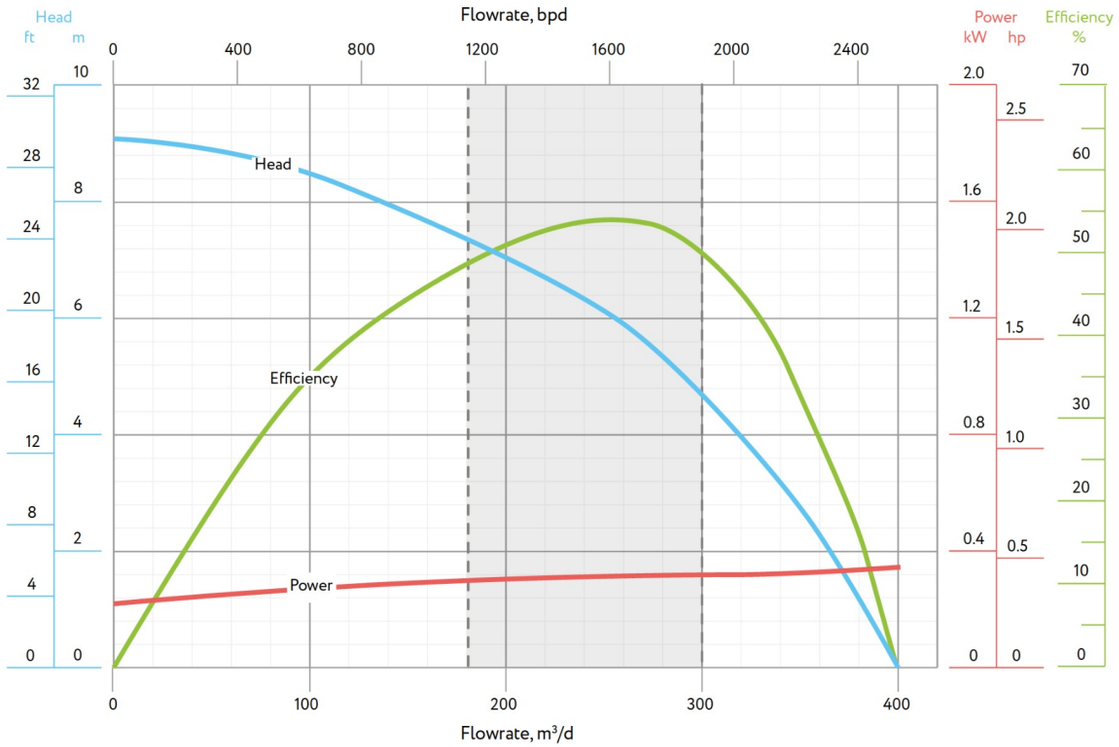
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		54 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,897 bpd	302 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	1,362 - 2,269 bpd	217 - 361 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	28.9 ft	8.8 m
Shaft limit	standard (direct start)	298 hp	222 kW		power	0.749 hp	0.558 kW
	high-strength (soft start)	550 hp	410 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



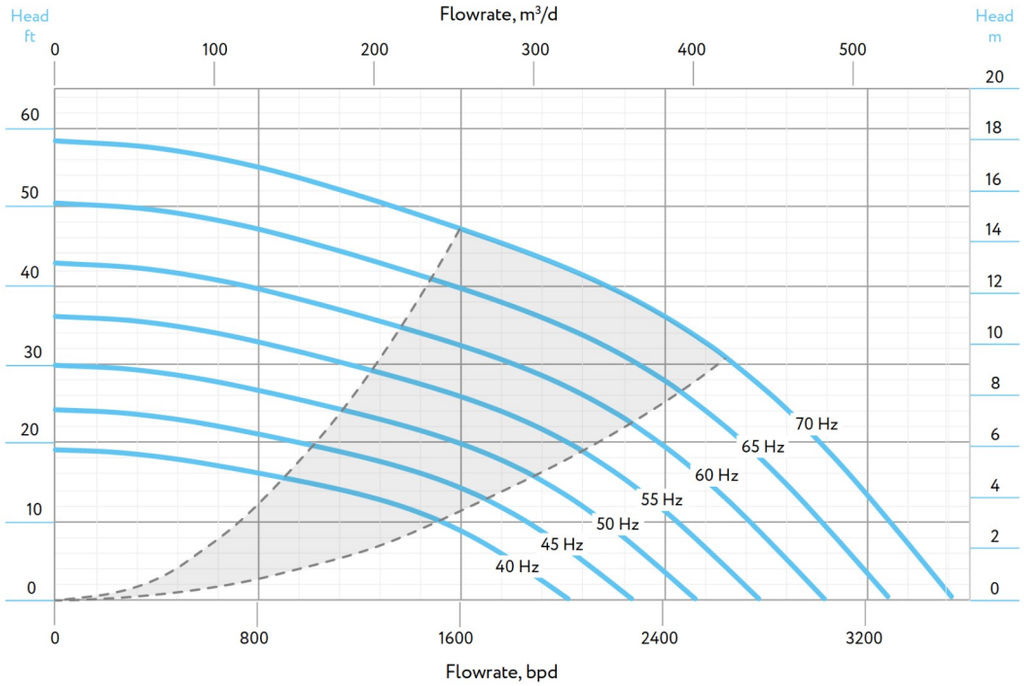
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		54 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,579 bpd	251 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	1,132 - 1,887 bpd	180 - 300 m^3/d
	shaft cross-sectional area	0.589 in^2	380.13 mm^2	**Stage**	head	20.0 ft	6.1 m
Shaft limit	standard (direct start)	248 hp	185 kW		power	0.434 hp	0.323 kW
	high-strength (soft start)	459 hp	342 kW		rotational direction	CW	

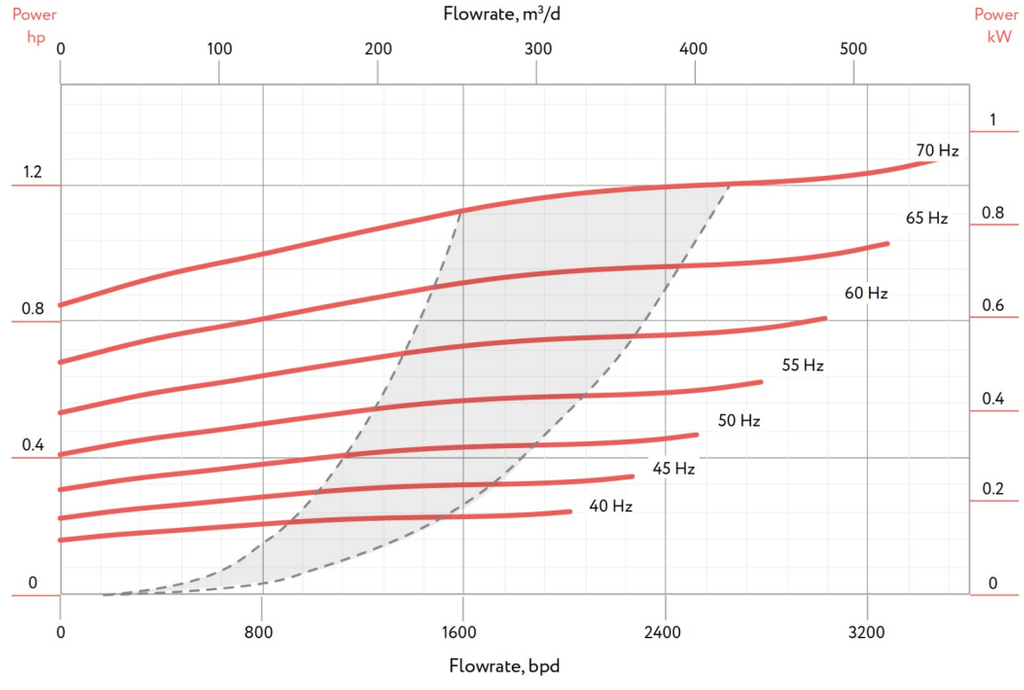
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
1M	24	3.9	1.202	144	65
2M	56	7.2	2.202	234	106
3M	85	10.5	3.202	318	144

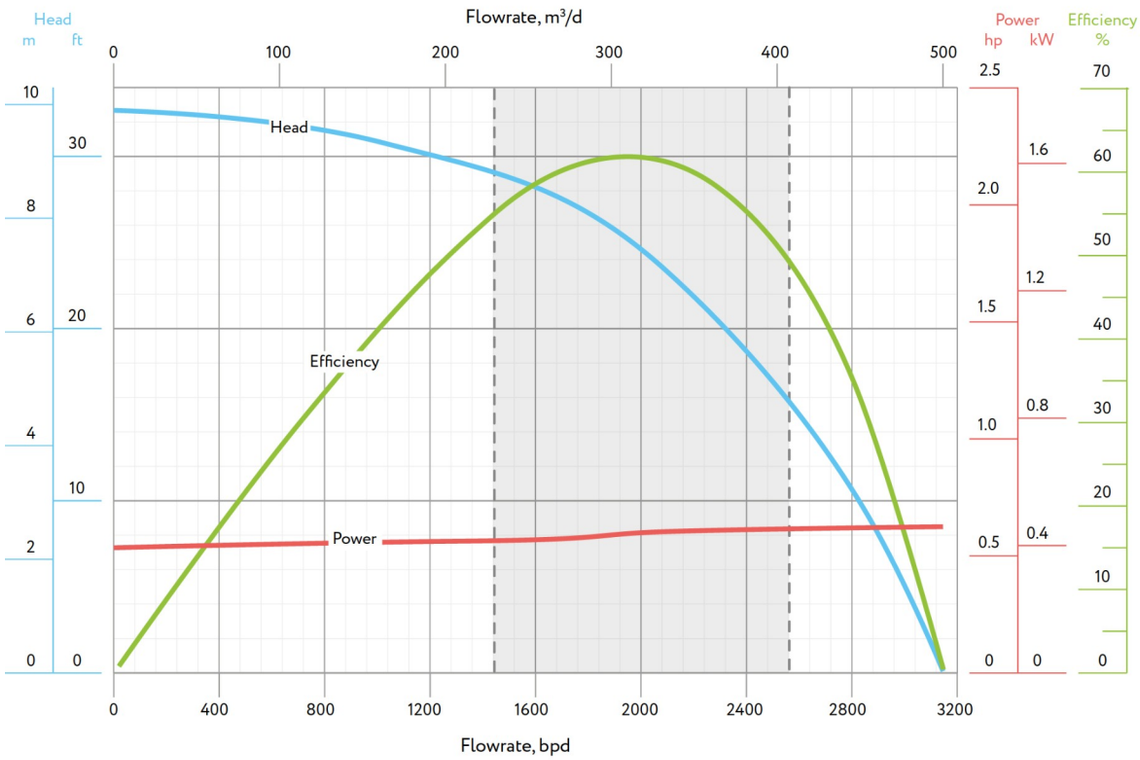
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	94	10.5	3.202	311	141
3.5M	109	12.1	3.702	353	160
4M	125	13.8	4.202	397	180
4.5M	141	15.4	4.702	439	199
5M	157	17.1	5.202	481	218
5.5M	172	18.7	5.702	518	235

ESP-OS A 406-1950

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

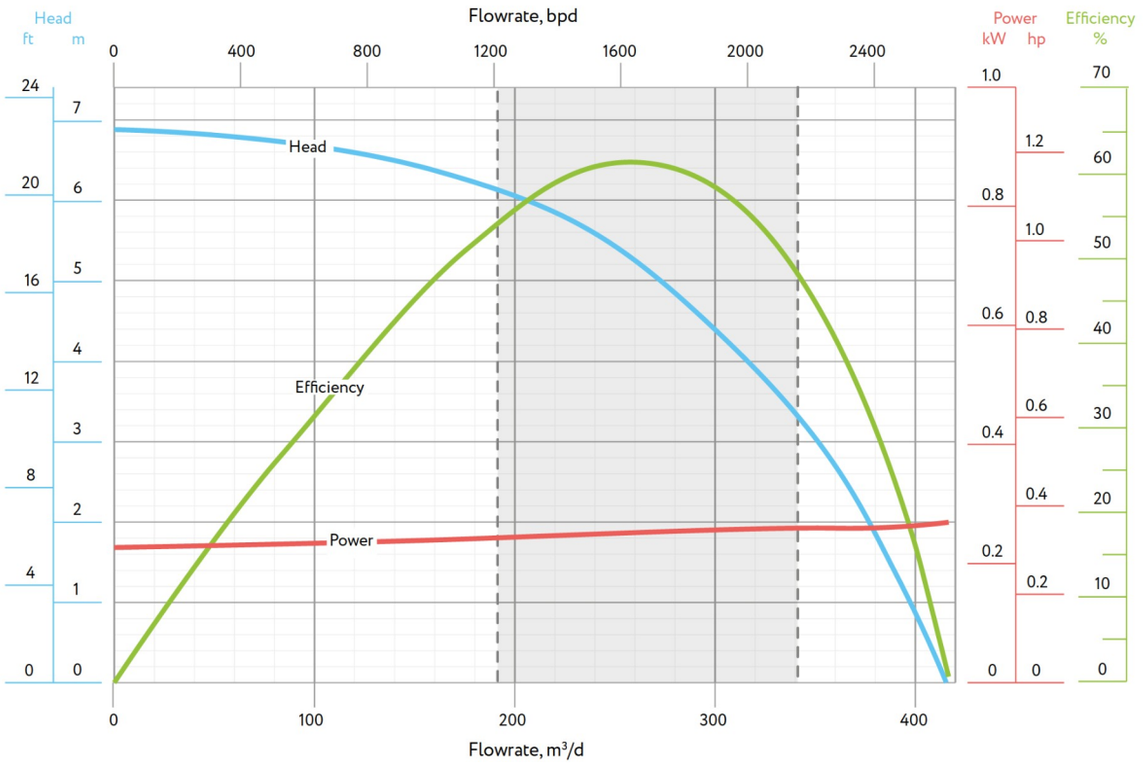
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		61.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,947 bpd	310 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	1,437 - 2,572 bpd	228 - 409 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	25.2 ft	7.7 m
Shaft limit	standard (direct start)	298 hp	222 kW		power	0.589 hp	0.439 kW
	high-strength (soft start)	550 hp	410 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



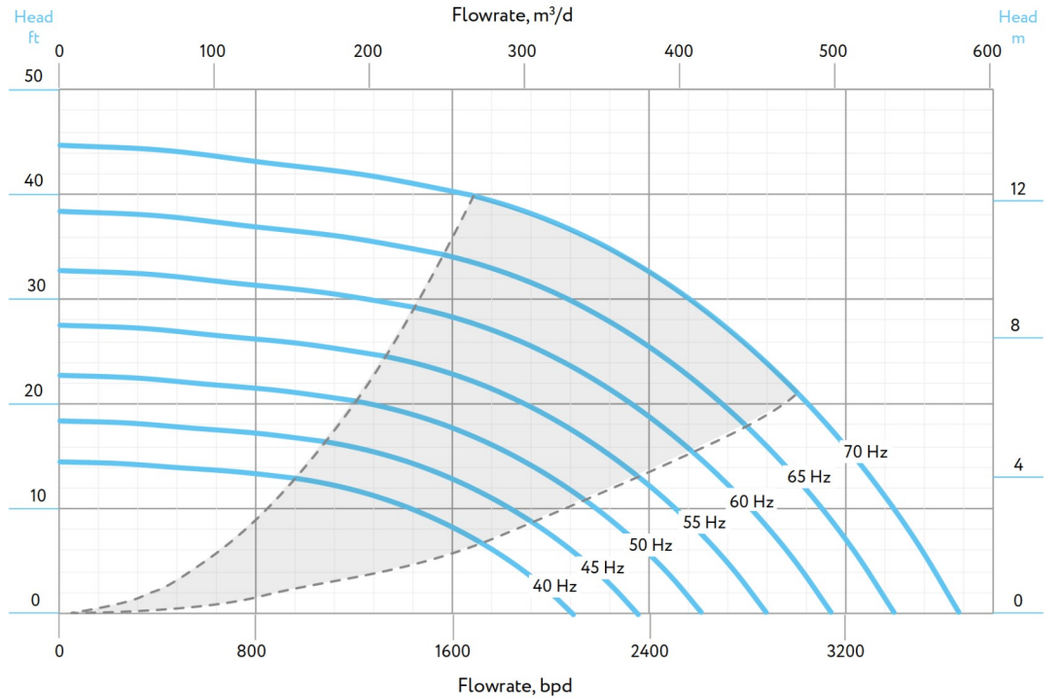
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		61.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	1,623 bpd	258 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	1,195 - 2,138 bpd	190 - 340 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	17.4 ft	5.3 m
Shaft limit	standard (direct start)	248 hp	185 kW		power	0.341 hp	0.254 kW
	high-strength (soft start)	459 hp	342 kW		rotational direction	CW	

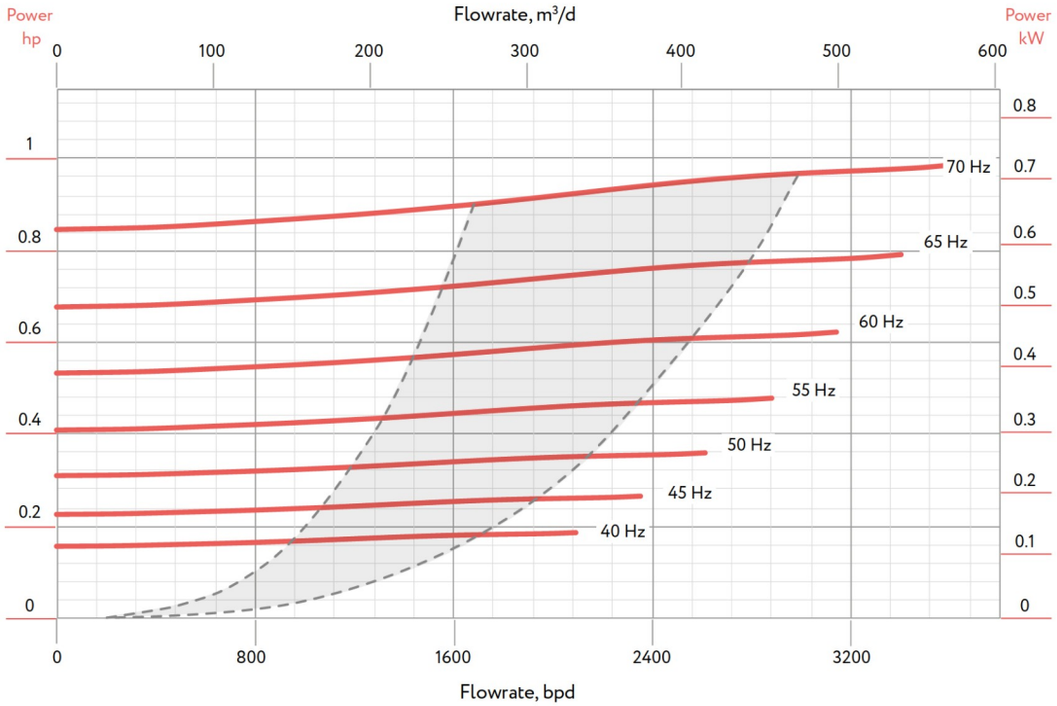
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



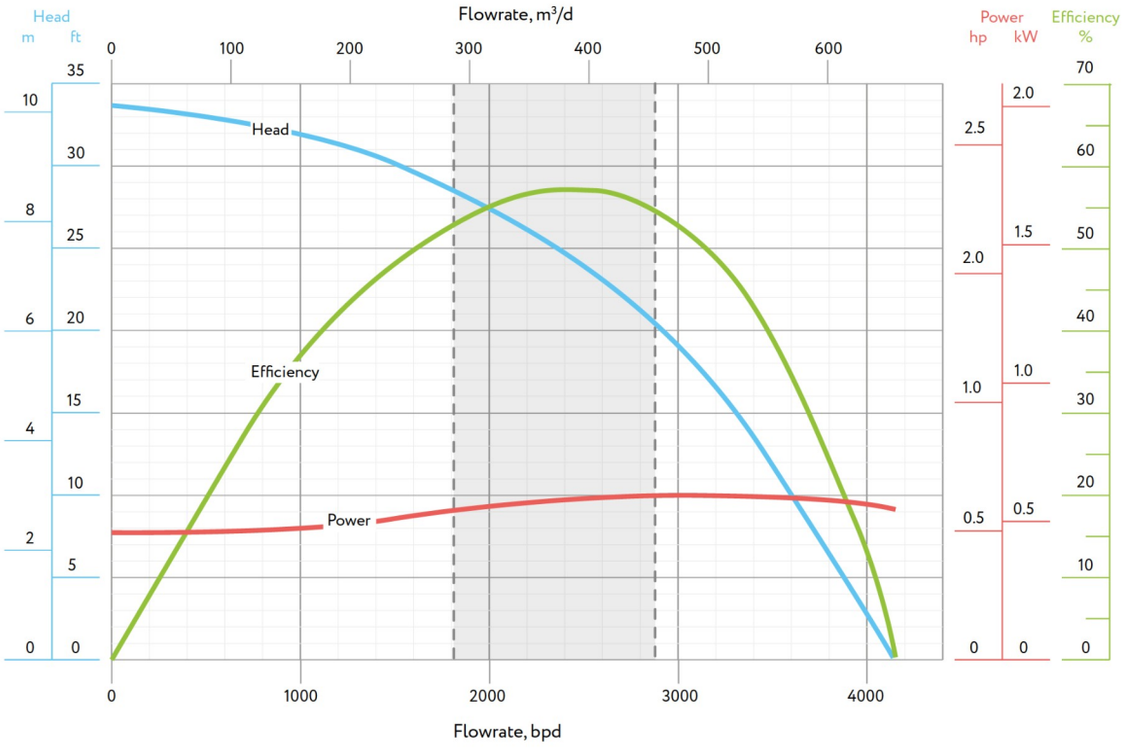
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	54	10.5	3.202	311	141
3.5M	64	12.1	3.702	353	160
4M	74	13.8	4.202	397	180
4.5M	83	15.4	4.702	439	199
5M	93	17.1	5.202	481	218
5.5M	102	18.7	5.702	518	235
6M	112	20.3	6.202	556	252

ESP-OS A 406-2400

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

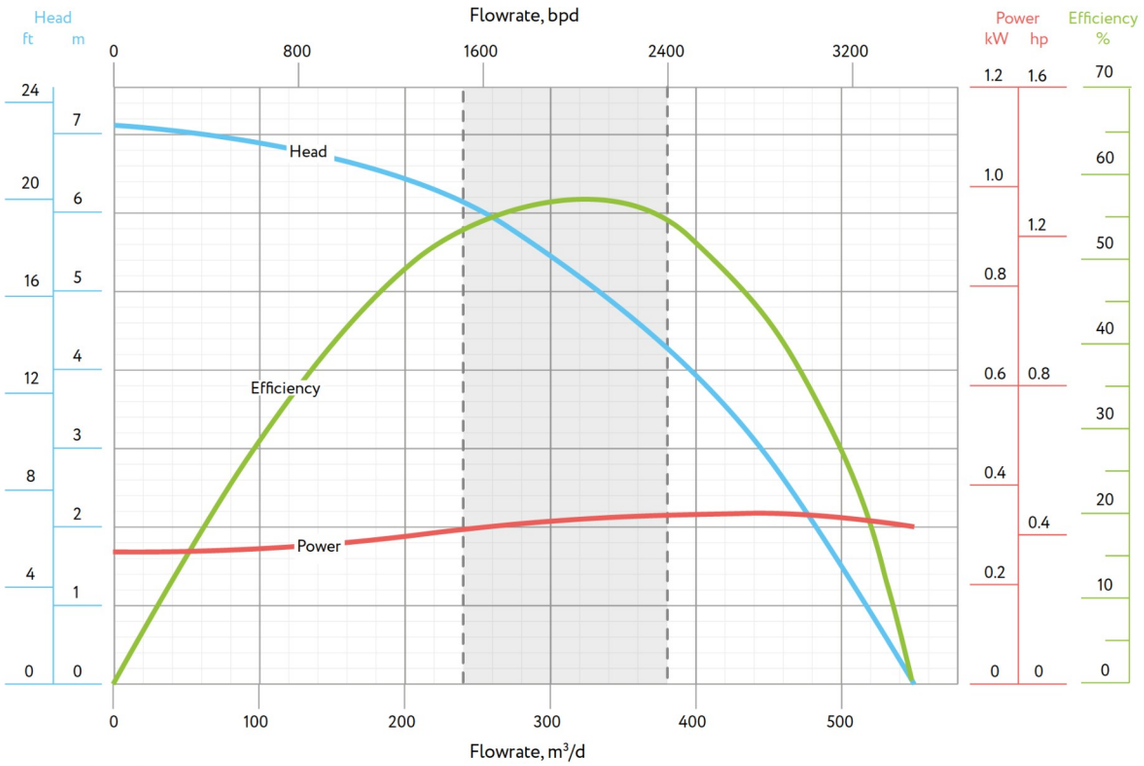
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		57 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	2,425 bpd	386 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	1,815 - 2,874 bpd	289 - 457 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	24.6 ft	7.5 m
Shaft limit	standard (direct start)	298 hp	222 kW		power	0.775 hp	0.577 kW
	high-strength (soft start)	550 hp	410 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



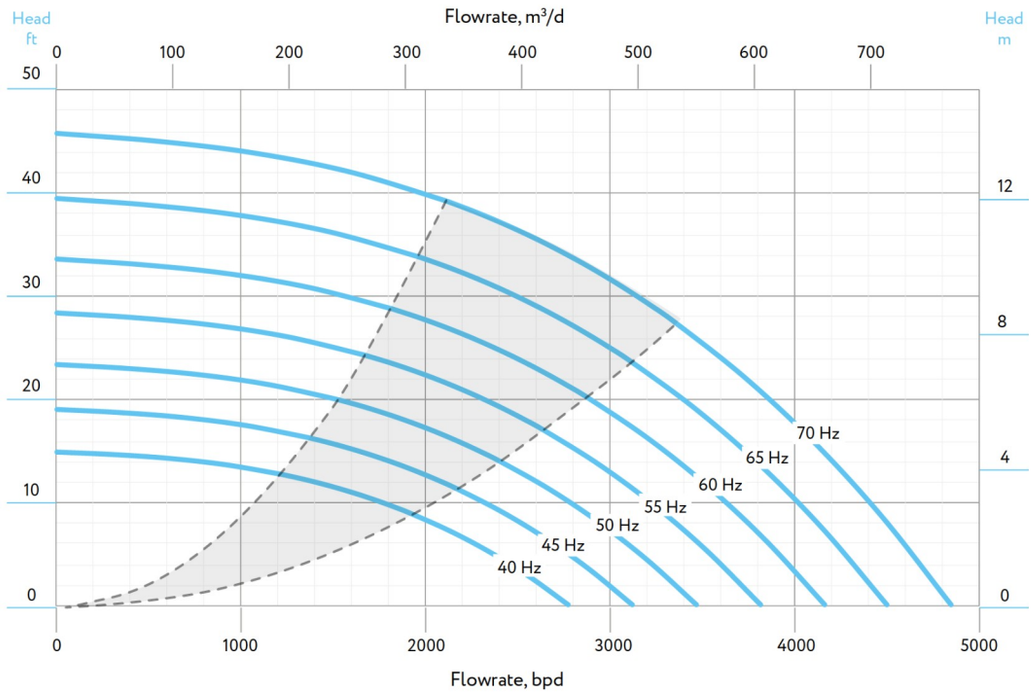
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		57 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	2,019 bpd	321 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	1,509 - 2,390 bpd	240 - 380 m^3/d
	shaft cross-sectional area	0.589 in^2	380.13 mm^2	**Stage**	head	17.1 ft	5.2 m
Shaft limit	standard (direct start)	248 hp	185 kW		power	0.448 hp	0.334 kW
	high-strength (soft start)	459 hp	342 kW		rotational direction	CW	

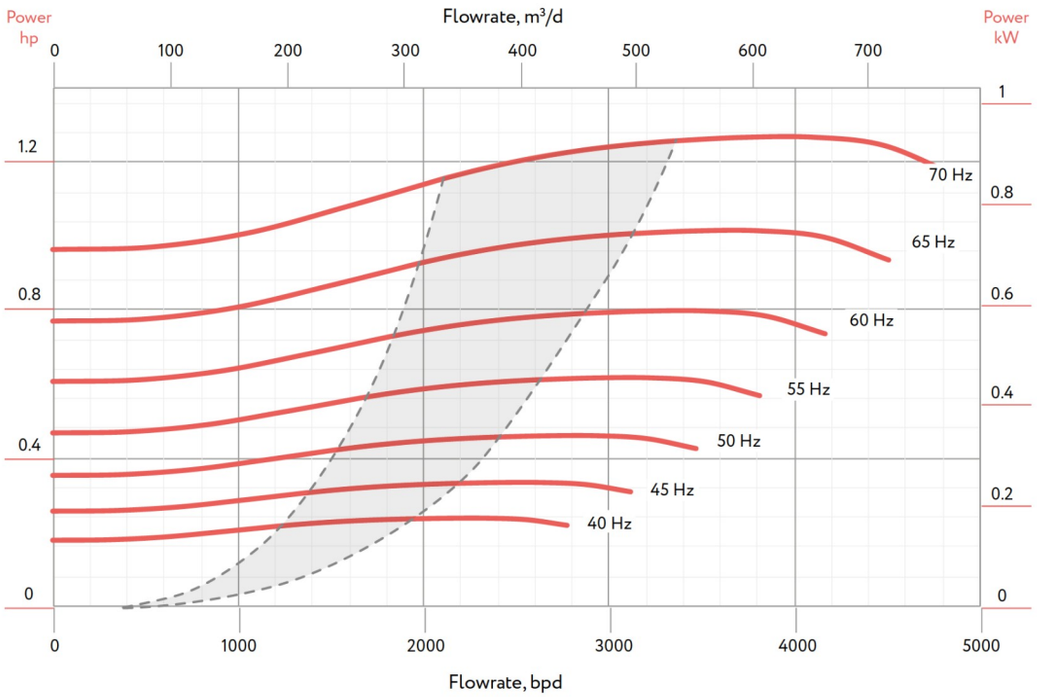
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



quality integrity innovations

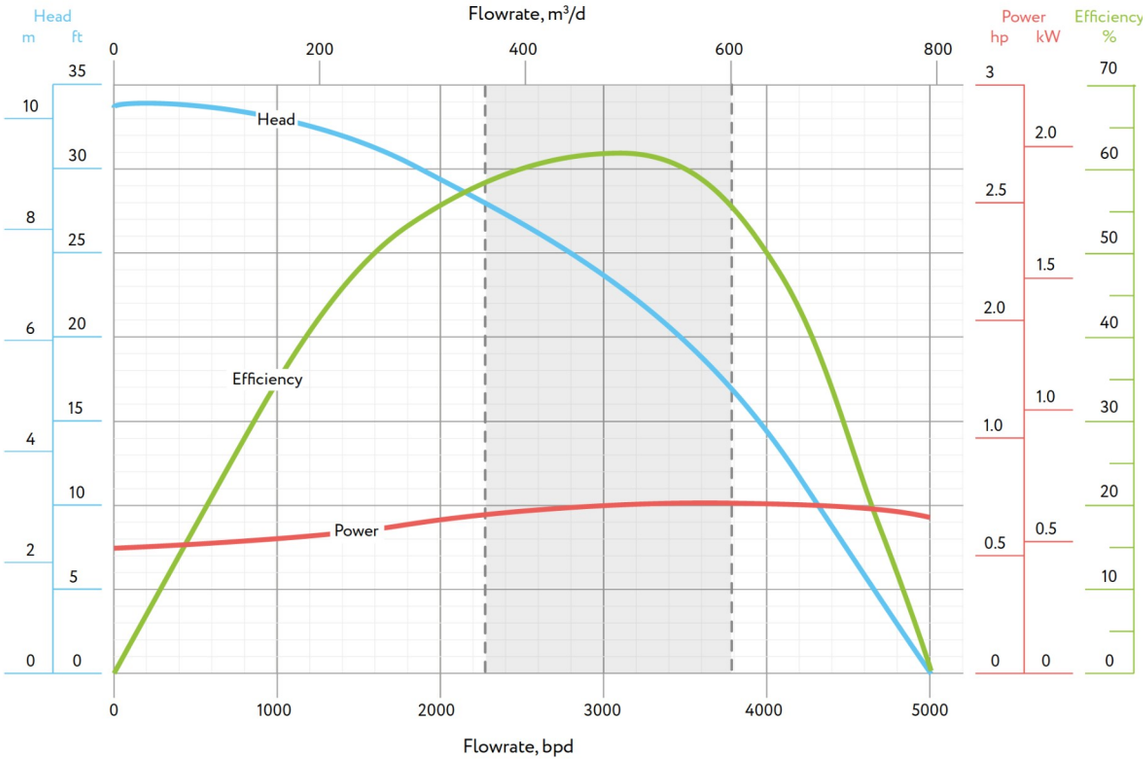
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	46	10.5	3.202	311	152
3.5M	54	12.1	3.702	353	160
4M	62	13.8	4.202	426	193
4.5M	70	15.4	4.702	472	214
5M	77	17.1	5.202	516	234
5.5M	85	18.7	5.702	560	254
6M	93	20.3	6.202	604	274

ESP-OS A 406-3100

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

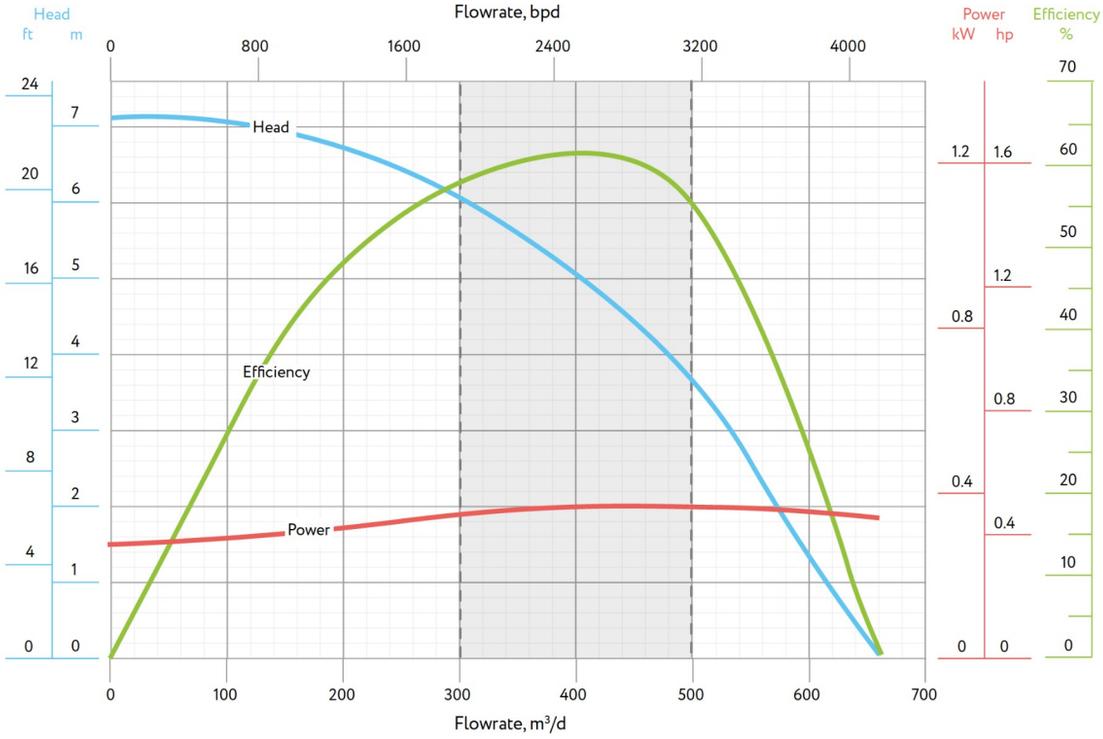
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		61 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	3,095 bpd	492 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	2,269 - 3,782 bpd	361 - 601 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	23.2 ft	7.1 m
Shaft limit	standard (direct start)	298 hp	222 kW		power	0.865 hp	0.644 kW
	high-strength (soft start)	550 hp	410 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



TECHNICAL DATA

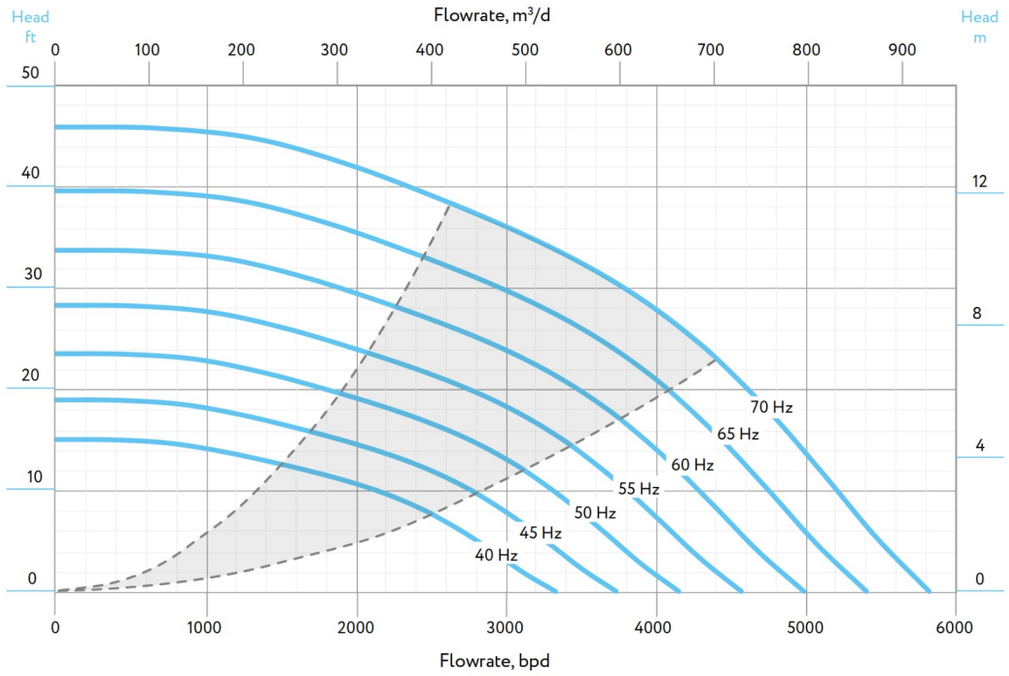
50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		61 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	2,579 bpd	410 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	1,887 - 3,145 bpd	300 - 500 m^3/d
	shaft cross-sectional area	0.589 in^2	380.13 mm^2	**Stage**	head	16.1 ft	4.9 m
Shaft limit	standard (direct start)	248 hp	185 kW		power	0.501 hp	0.373 kW
	high-strength (soft start)	459 hp	342 kW		rotational direction	CW	

quality integrity innovations

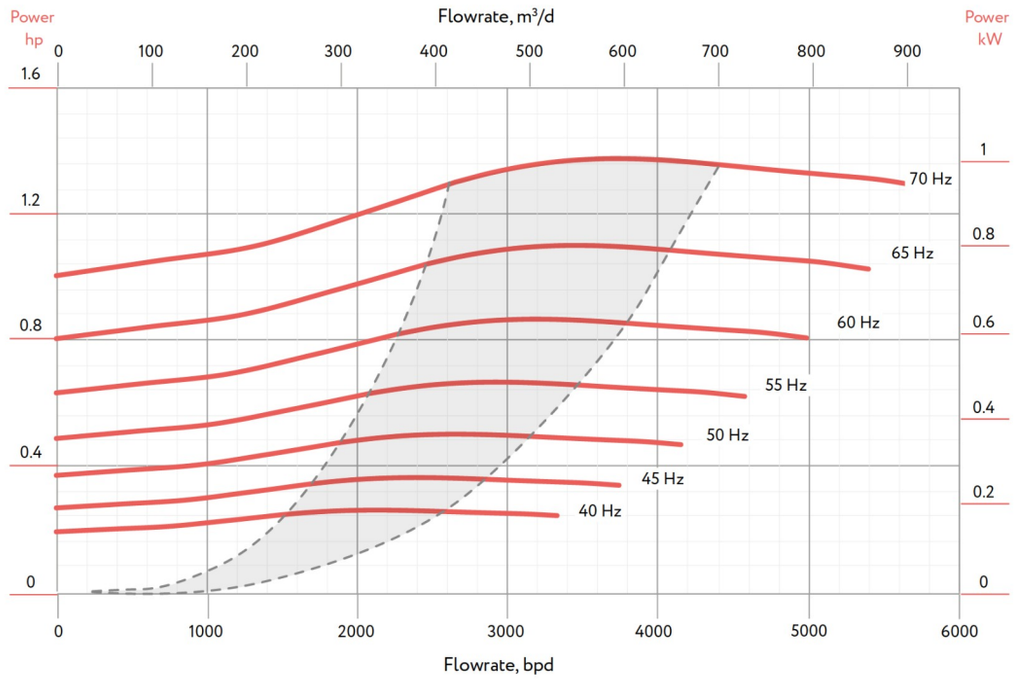
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



406 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	49	10.5	3.202	320	145
3.5M	58	12.1	3.702	364	165
4M	66	13.8	4.202	388	176
4.5M	75	15.4	4.702	454	206
5M	84	17.1	5.202	501	227
5.5M	93	18.7	5.702	545	247

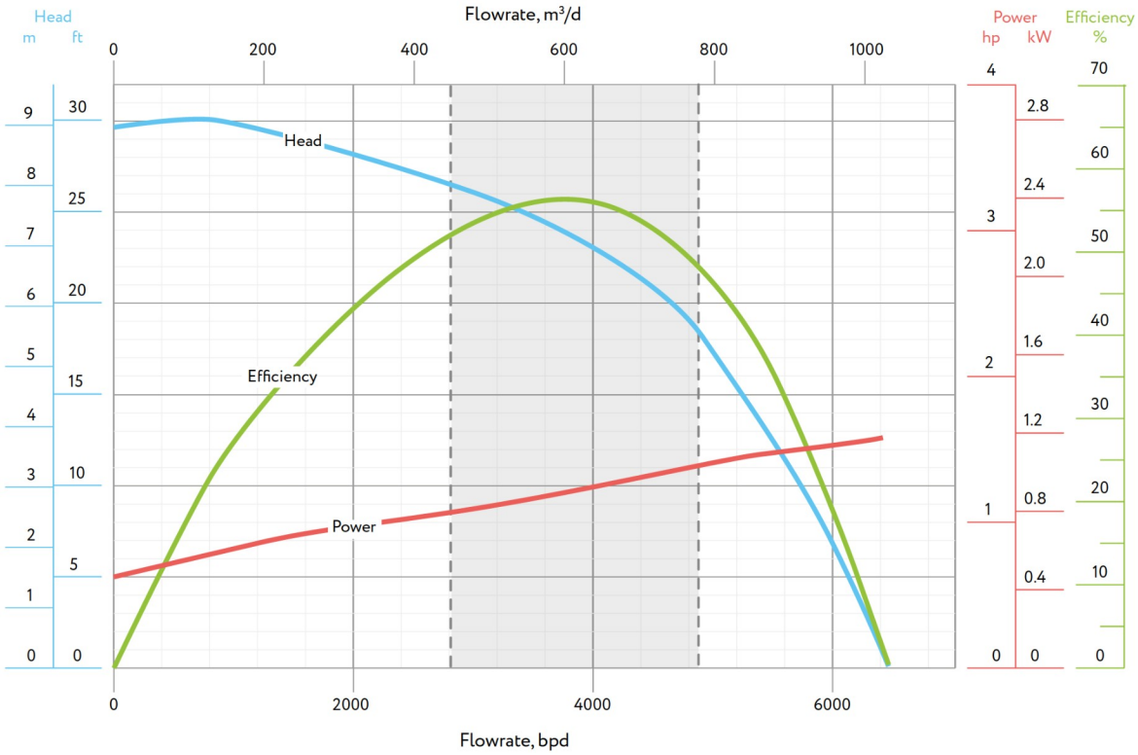
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	50	10.5	3.202	335	152
3.5M	58	12.1	3.702	353	160
4M	67	13.8	4.202	426	193
4.5M	76	15.4	4.702	472	214
5M	85	17.1	5.202	516	234
5.5M	94	18.7	5.702	560	254
6M	102	20.3	6.202	604	274

ESP-OS A 406-3700

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

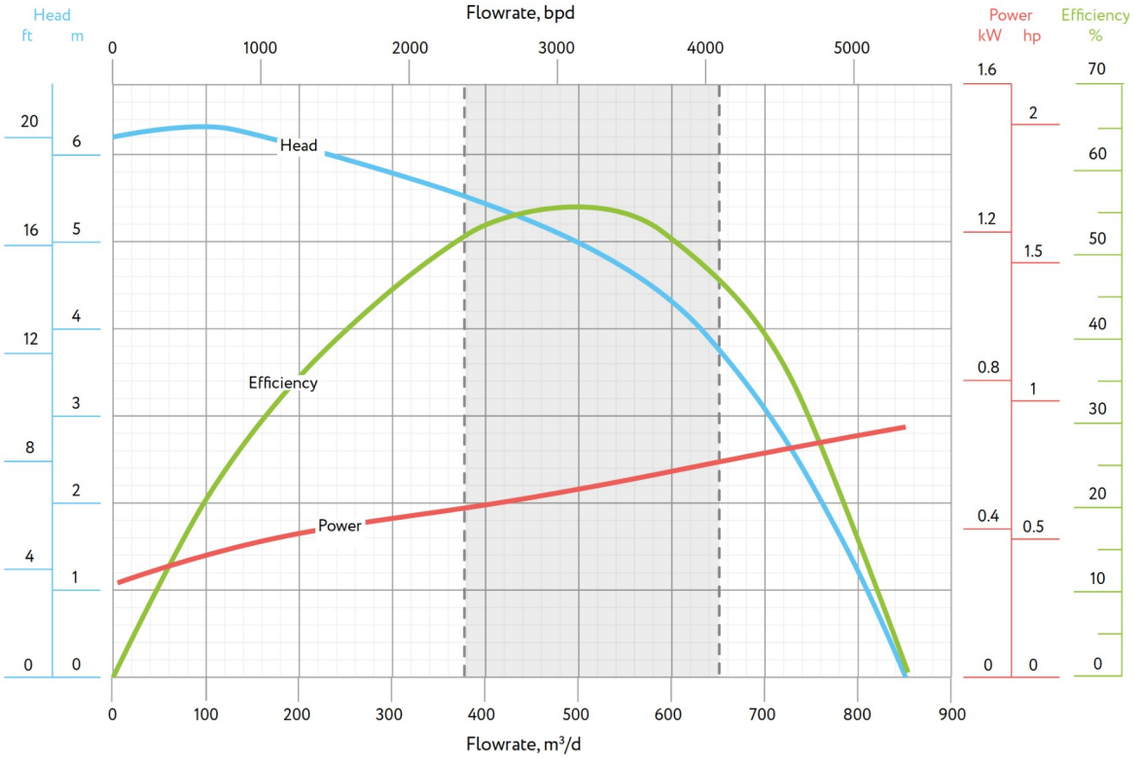
60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		56 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	3,725 bpd	592 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	2,837 - 4,917 bpd	451 - 782 m^3/d
	shaft cross-sectional area	0.589 in^2	380.13 mm^2	**Stage**	head	23.9 ft	7.3 m
Shaft limit	standard (direct start)	298 hp	222 kW		power	1.176 hp	0.876 kW
	high-strength (soft start)	550 hp	410 kW		rotational direction	CW	

406 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



TECHNICAL DATA

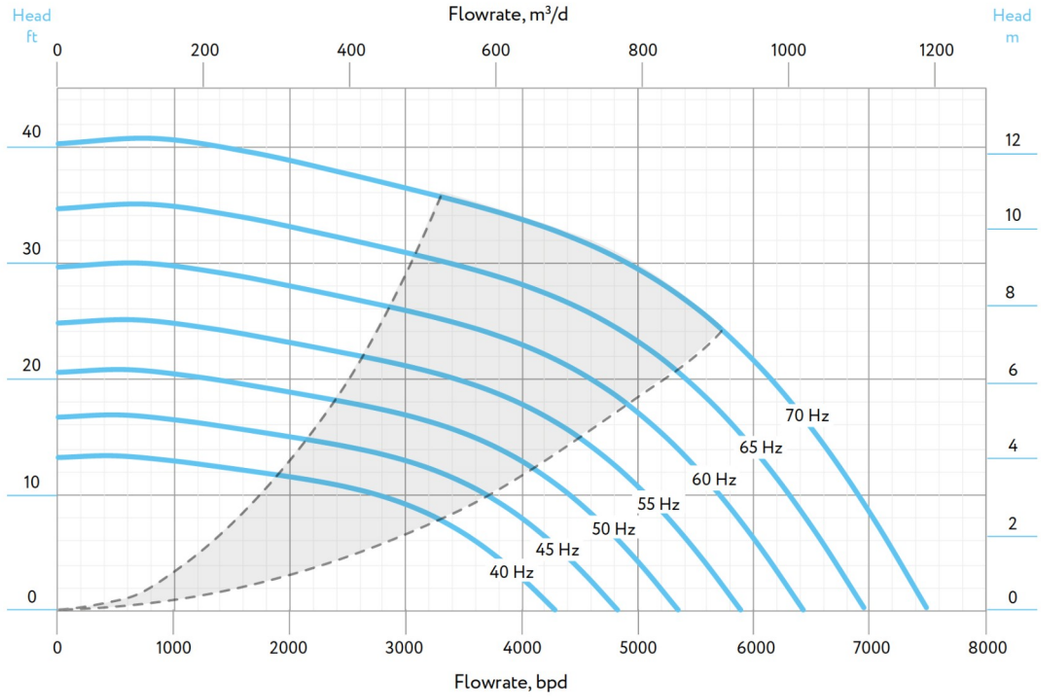
50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		56 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	3,107 bpd	494 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	2,358 - 4,088 bpd	375 - 650 m^3/d
	shaft cross-sectional area	0.589 in^2	380.13 mm^2	**Stage**	head	16.7 ft	5.1 m
Shaft limit	standard (direct start)	248 hp	185 kW		power	0.681 hp	0.507 kW
	high-strength (soft start)	459 hp	342 kW		rotational direction	CW	

quality integrity innovations

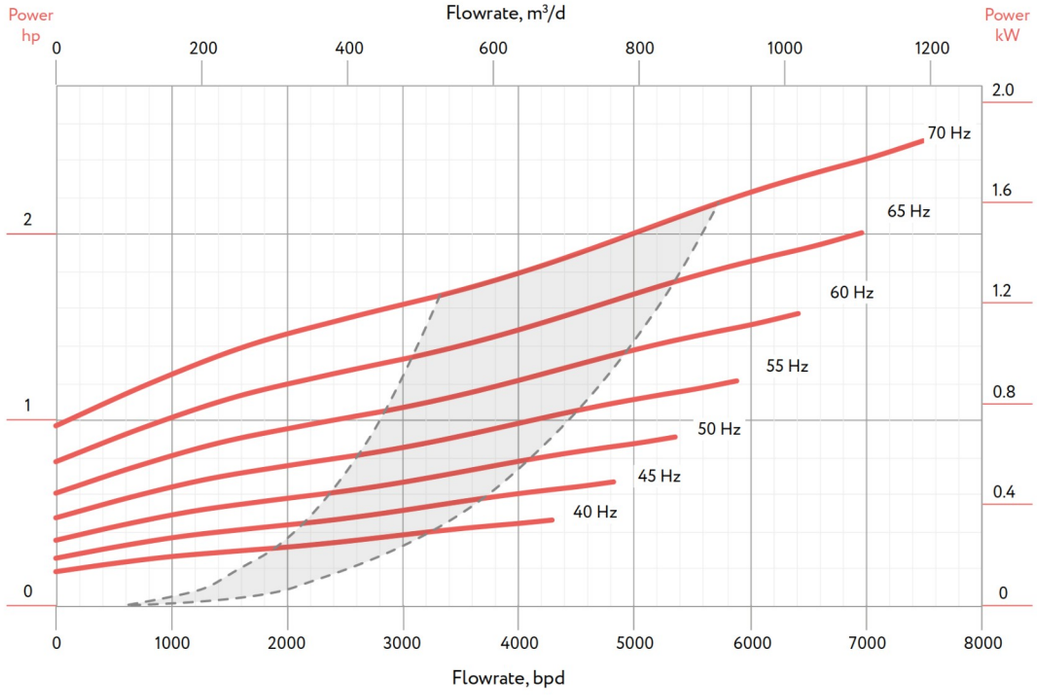
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



quality integrity innovations

406 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	45	10.5	3.202	333	151
3.5M	53	12.1	3.702	379	172
4M	61	13.8	4.202	426	193
4.5M	69	15.4	4.702	472	214
5M	77	17.1	5.202	518	235
5.5M	85	18.7	5.702	565	256

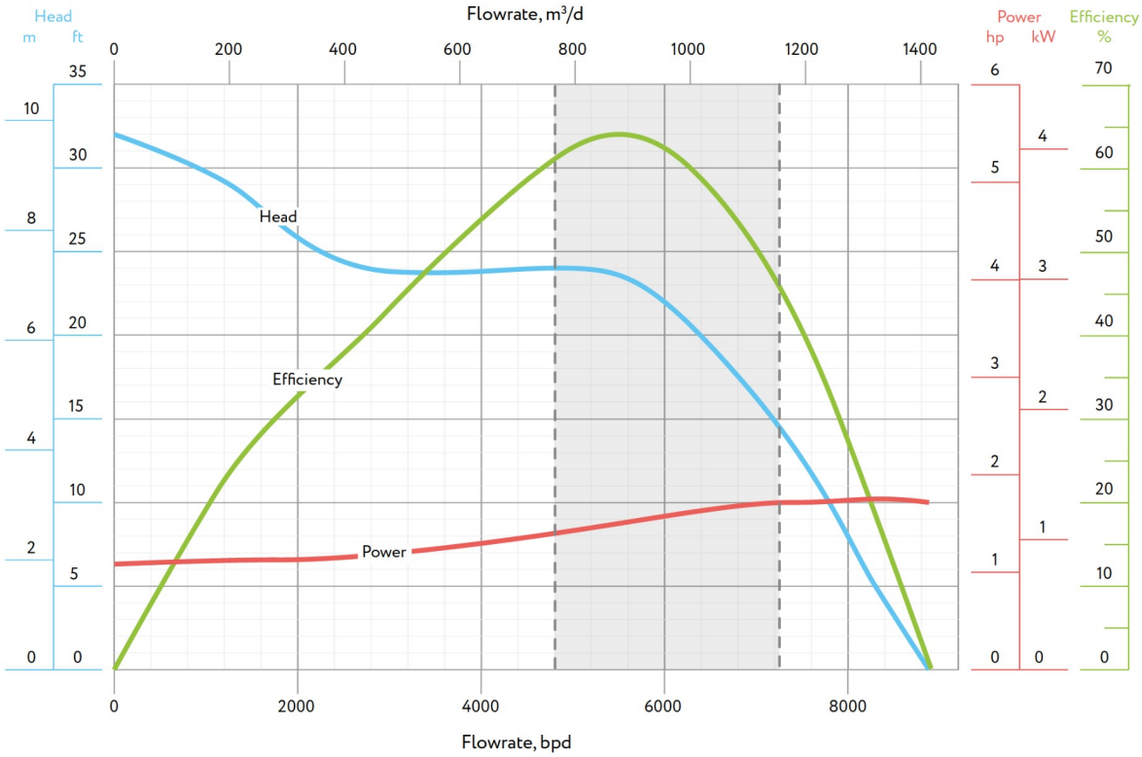
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	46	10.5	3.202	338	153
4M	62	13.8	4.202	430	195
5M	78	17.1	5.202	521	236

ESP-OS A 406-5500

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



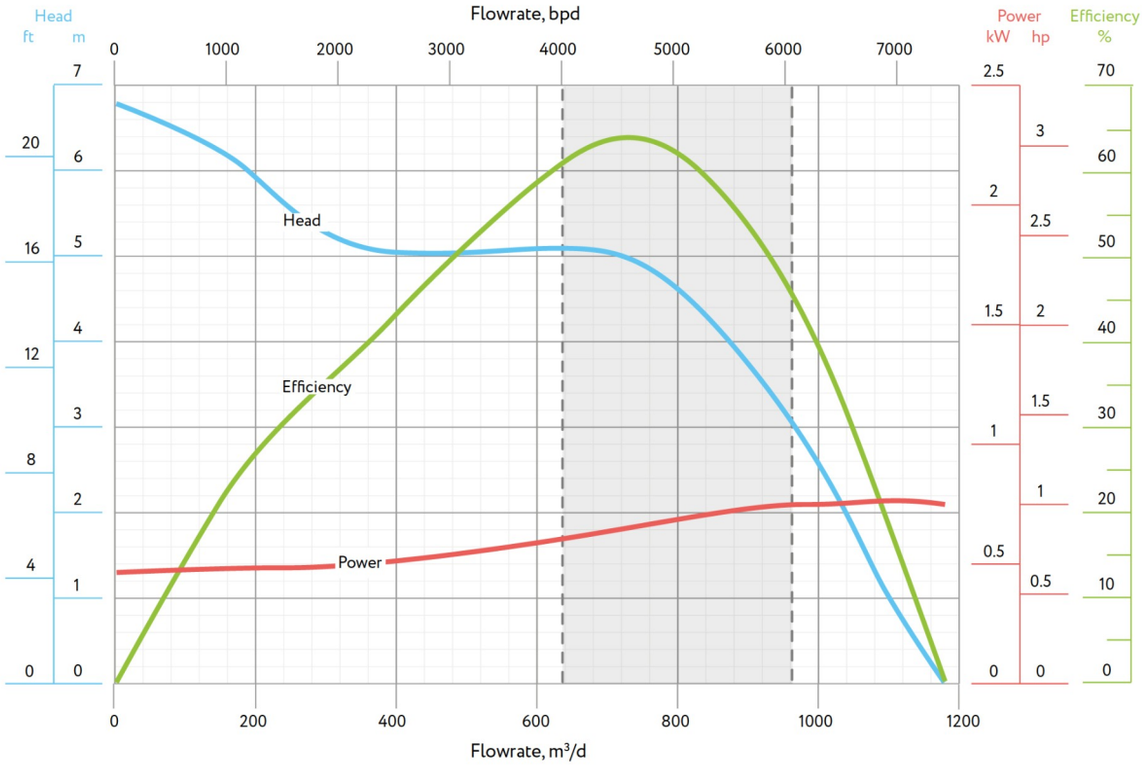
TECHNICAL DATA

60 HZ-3,500 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		63.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	5,481 bpd	871 m^3/d
Shaft	diameter	0.984 in.	25.0 mm		recommended operating range	4,841 - 7,262 bpd	770 - 1,155 m^3/d
	shaft cross-sectional area	0.761 in^2	490.87 mm^2	**Stage**	head	23.5 ft	7.2 m
Shaft limit	standard (direct start)	435 hp	324 kW		power	1.498 hp	1.116 kW
	high-strength (soft start)	812 hp	605 kW		rotational direction	CW	

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



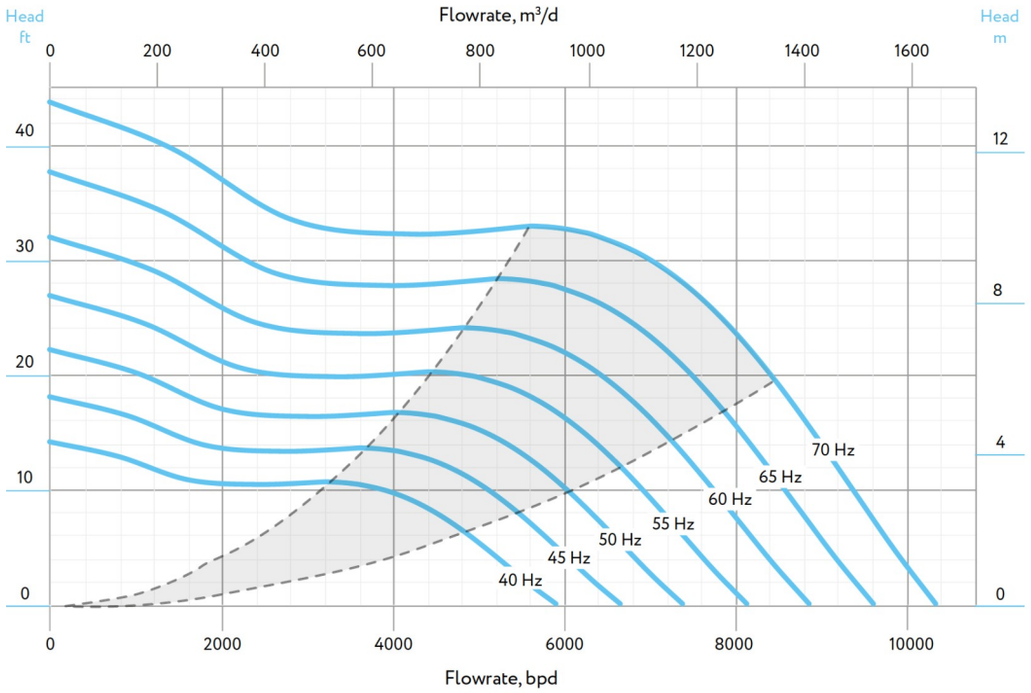
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.06 in.	103 mm	Best efficiency		63.5 %	
	housing pressure limit	6,000 psi	465 bar	**Pump**	optimum flow rate	4,566 bpd	726 m^3/d
Shaft	diameter	0.984 in.	25.0 mm		recommended operating range	4,025 - 6,038 bpd	640 - 960 m^3/d
	shaft cross-sectional area	0.761 $in.^2$	490.87 mm^2	**Stage**	head	16.4 ft	5.0 m
Shaft limit	standard (direct start)	362 hp	270 kW		power	0.867 hp	0.646 kW
	high-strength (soft start)	677 hp	504 kW		rotational direction	CW	

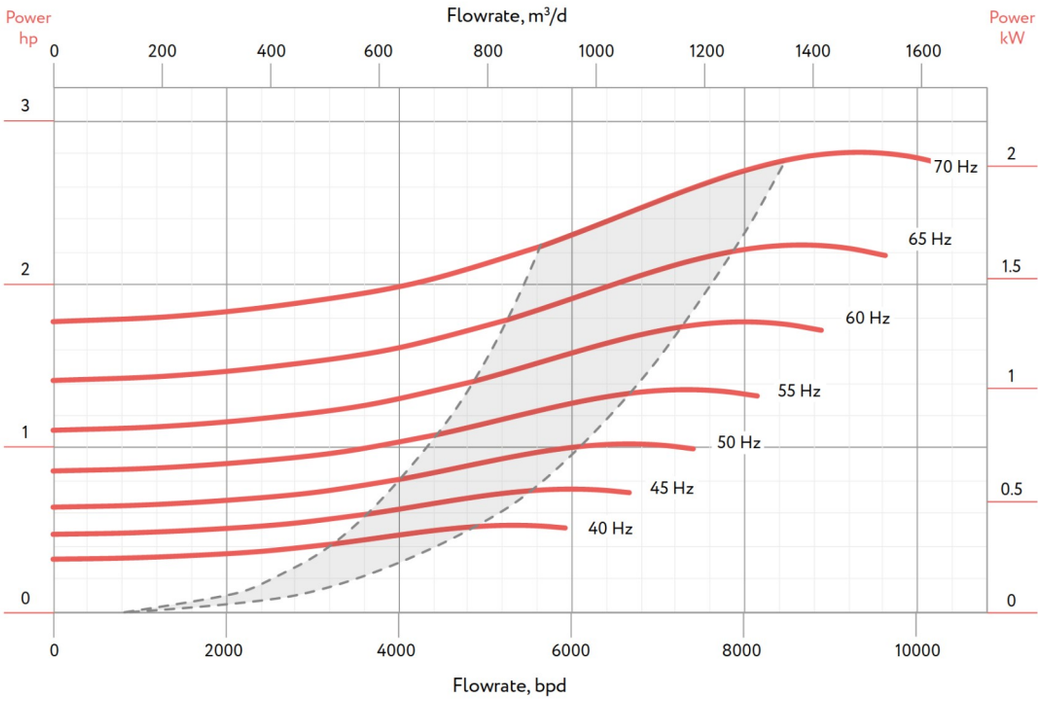
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	34	10.5	3.202	333	151
4M	46	13.8	4.202	426	193
5M	58	17.1	5.202	518	235

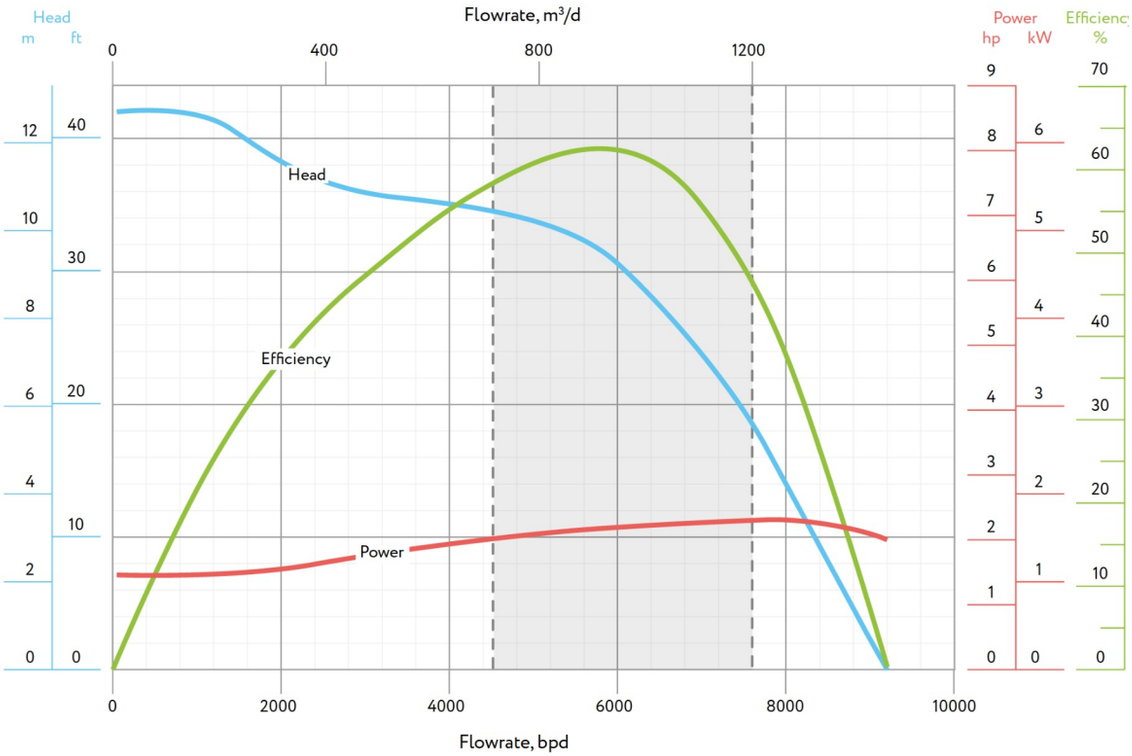
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	34	10.5	3.202	338	151
4M	46	13.8	4.202	426	193
5M	59	17.1	5.202	518	235

ESP-OS A 449-5700

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

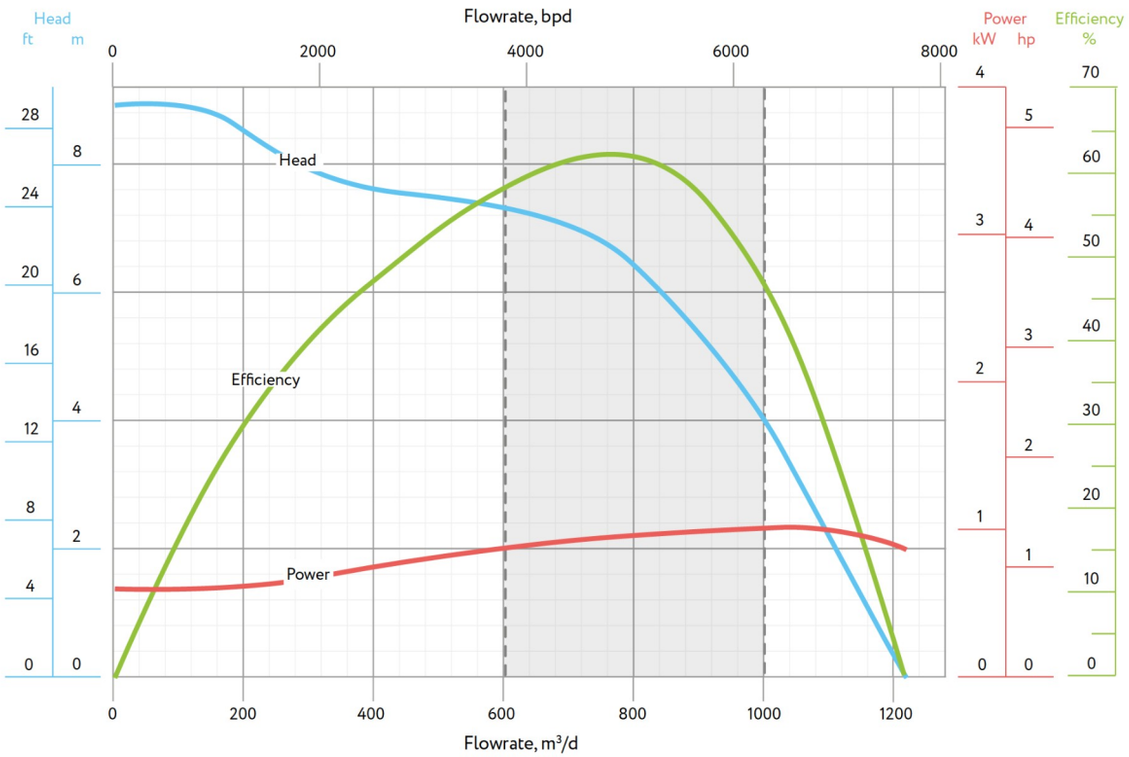
60 HZ-3,500 RPM

Housing	outer diameter	4.49 in.	114 mm	Best efficiency		62 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	5,730 bpd	911 m^3/d
Shaft	diameter	1.102 in.	28.0 mm		recommended operating range	4,539 - 7,564 bpd	722 - 1,203 m^3/d
	shaft cross-sectional area	0.954 $in.^2$	615.75 mm^2	**Stage**	head	31.8 ft	9.7 m
Shaft limit	standard (direct start)	596 hp	444 kW		power	2.154 hp	1.605 kW
	high-strength (soft start)	1,082 hp	806 kW		rotational direction	CW	

449 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



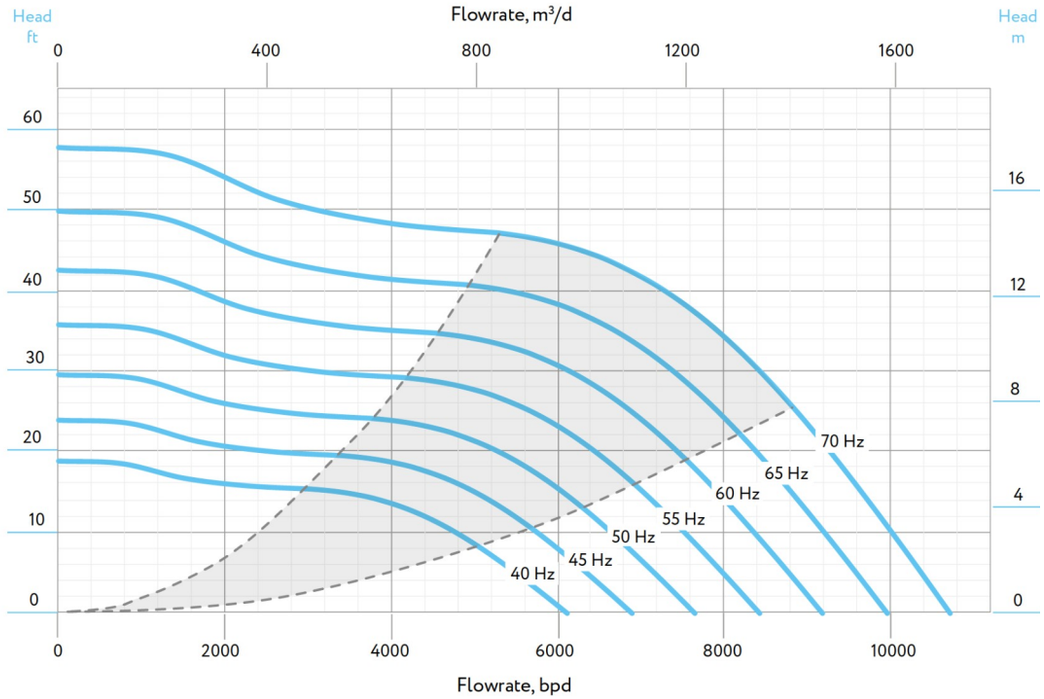
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.49 in.	114 mm	Best efficiency		62 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	4,774 bpd	759 m^3/d
Shaft	diameter	1.102 in.	28.0 mm		recommended operating range	3,774 - 6,289 bpd	600 - 1,000 m^3/d
	shaft cross-sectional area	0.954 in^2	615.75 mm^2	**Stage**	head	22.0 ft	6.7 m
Shaft limit	standard (direct start)	497 hp	370 kW		power	1.247 hp	0.929 kW
	high-strength (soft start)	902 hp	672 kW		rotational direction	CW	

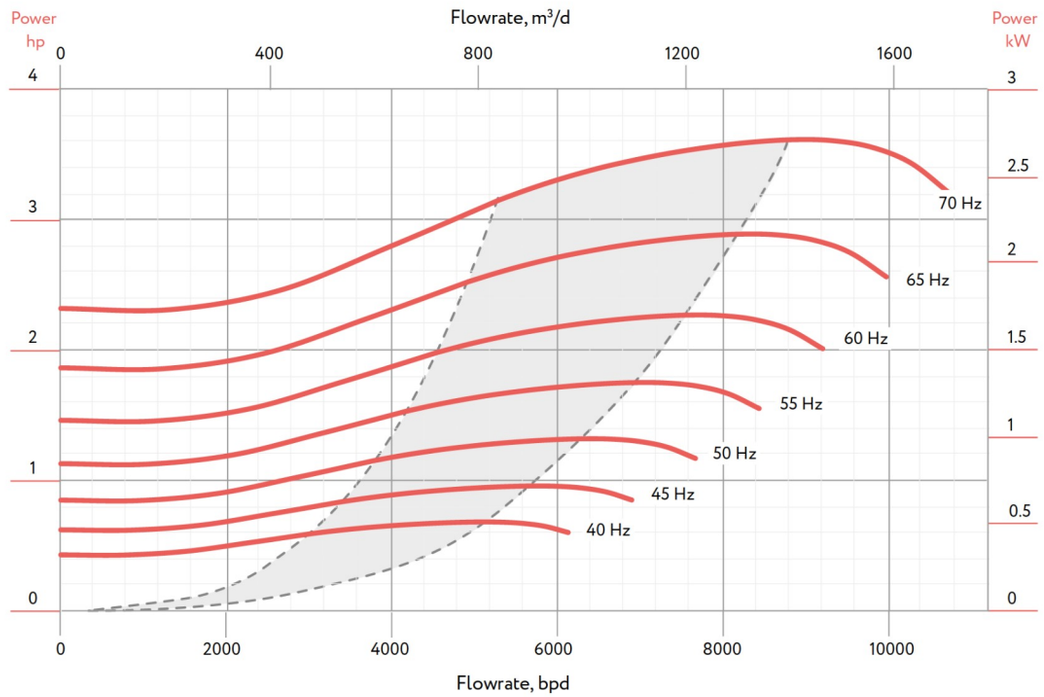
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



449 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	35	10.5	3.202	342	155
4M	48	13.8	4.202	461	209
5M	61	17.1	5.202	574	260

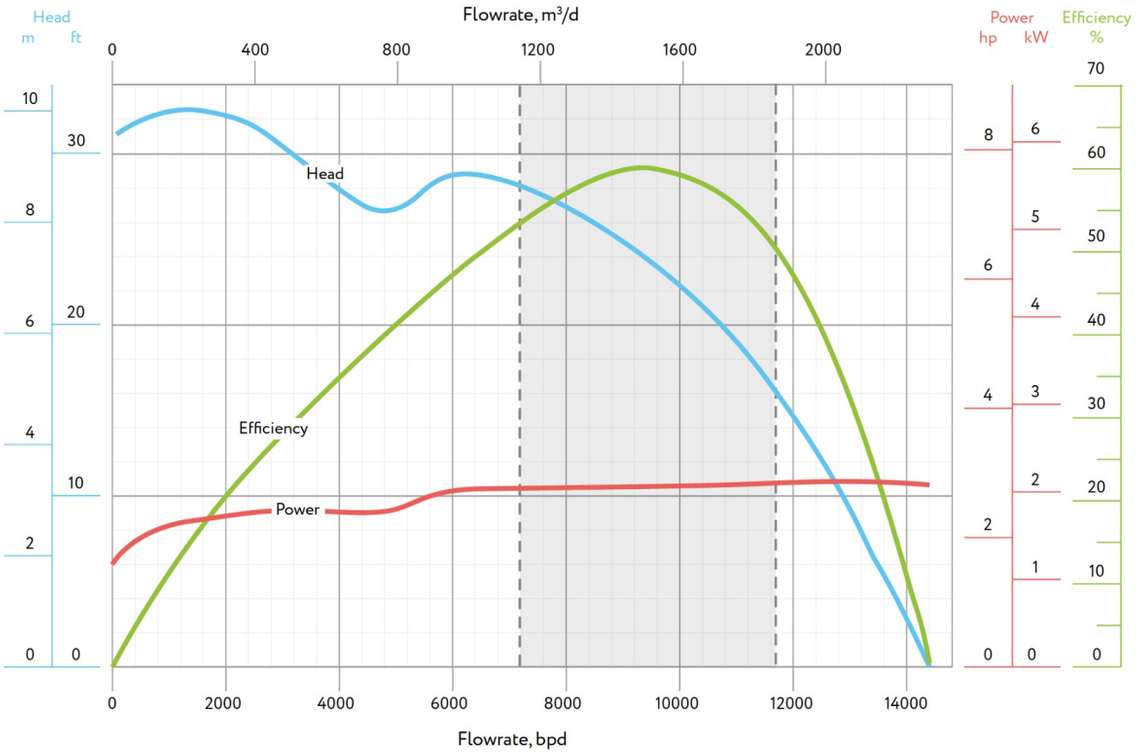
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	36	10.5	3.202	397	180
3.5M	42	12.1	3.702	450	204
4M	49	13.8	4.202	507	230
4.5M	55	15.4	4.702	560	254
5M	61	17.1	5.202	615	279
5.5M	68	18.7	5.702	670	304
6M	74	20.3	6.202	725	329

ESP-OS A 449-9400

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

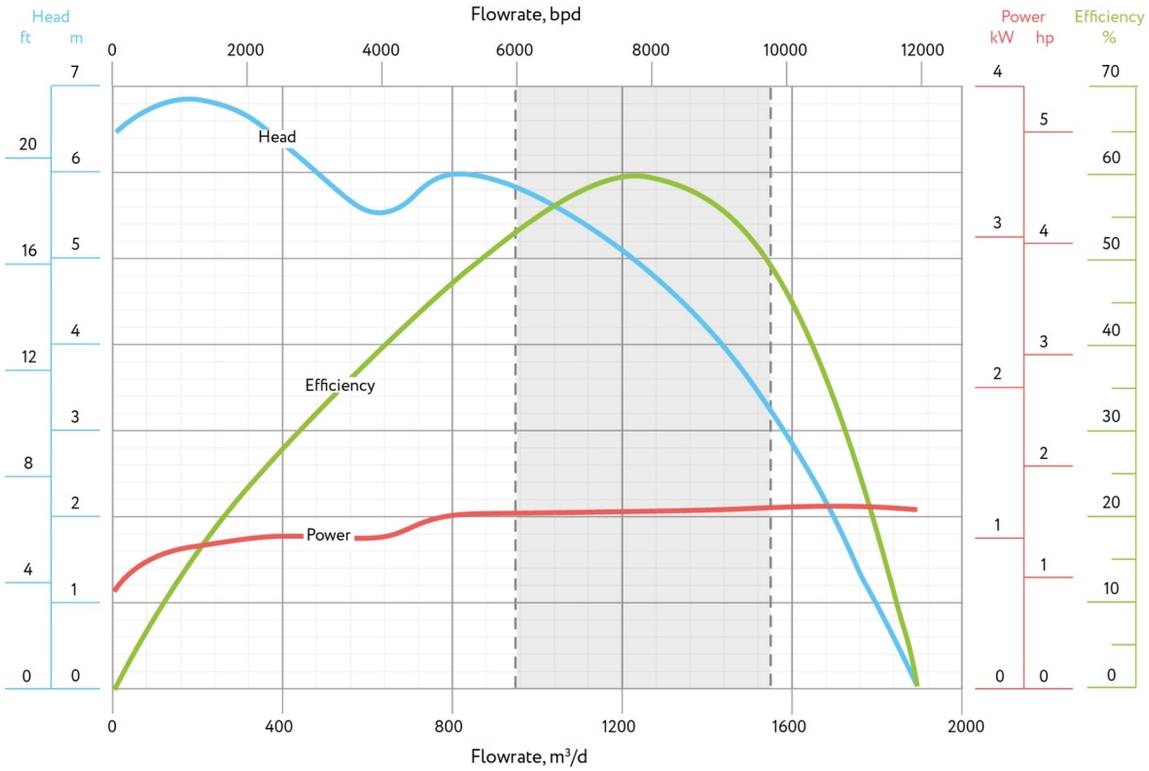
60 HZ-3,500 RPM

Housing	outer diameter	4.49 in.	114 mm	Best efficiency		60 %	
	housing pressure limit	6,000 psi	414 bar	Pump	optimum flow rate	9,434 bpd	1,500 m^3/d
Shaft	diameter	1.102 in.	28.0 mm		recommended operating range	7,186 - 11,725 bpd	1,143 - 1,864 m^3/d
	shaft cross-sectional area	0.954 $in.^2$	615.75 mm^2	Stage	head	23.68 ft	7.2 m
Shaft limit	standard (direct start)	596 hp	444 kW		power	2.746 hp	2.046 kW
	high-strength (soft start)	1,082 hp	806 kW		rotational direction	CW	

449 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



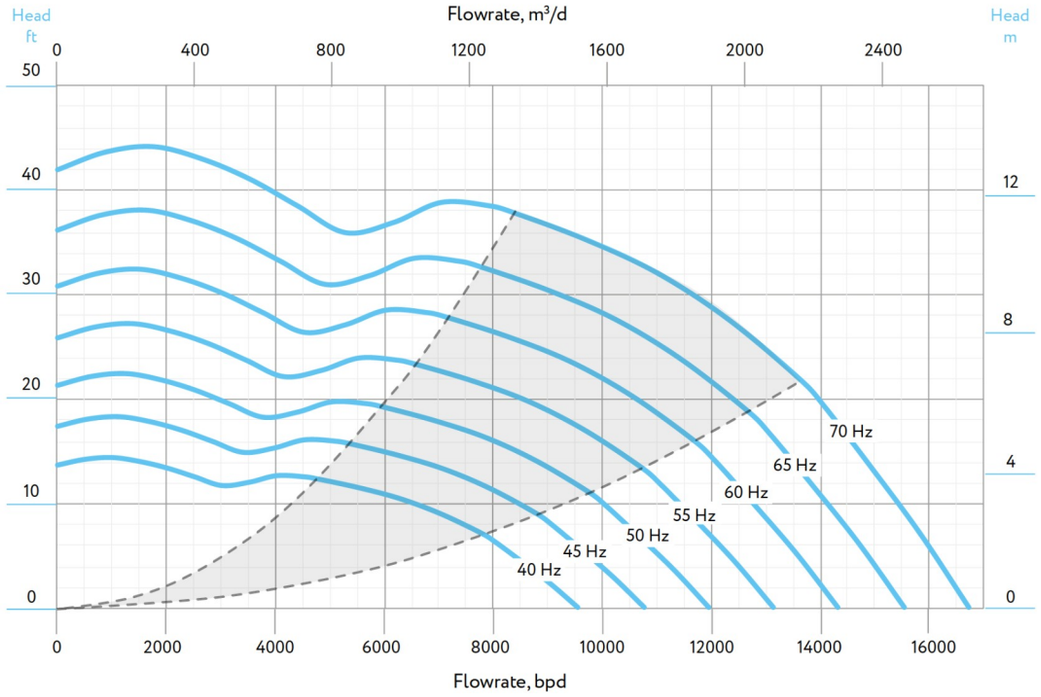
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	4.49 in.	114 mm	Best efficiency		60 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	7,862 bpd	1,250 m^3/d
Shaft	diameter	1.102 in.	28.0 mm		recommended operating range	5,985 - 9,771 bpd	952 - 1,553 m^3/d
	shaft cross-sectional area	0.954 in^2	615.75 mm^2	**Stage**	head	16.4 ft	5.0 m
Shaft limit	standard (direct start)	497 hp	370 kW		power	1.589 hp	1.184 kW
	high-strength (soft start)	902 hp	672 kW		rotational direction	CW	

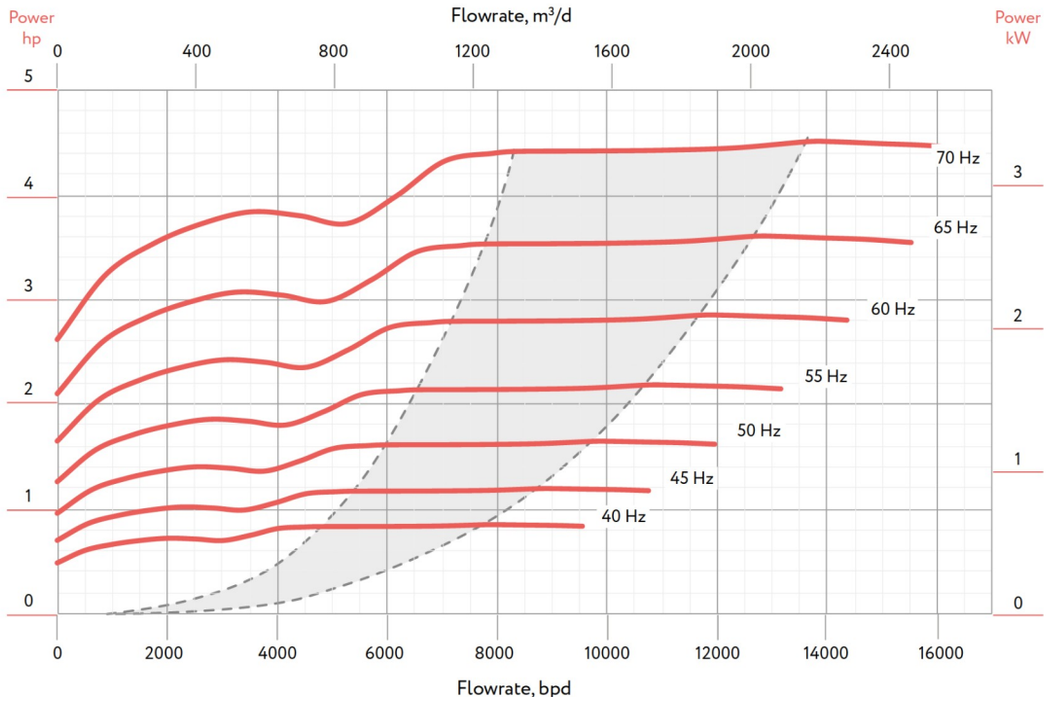
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



449 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	31	10.5	3.202	344	156
4M	42	13.8	4.202	463	210
5M	53	17.1	5.202	576	261

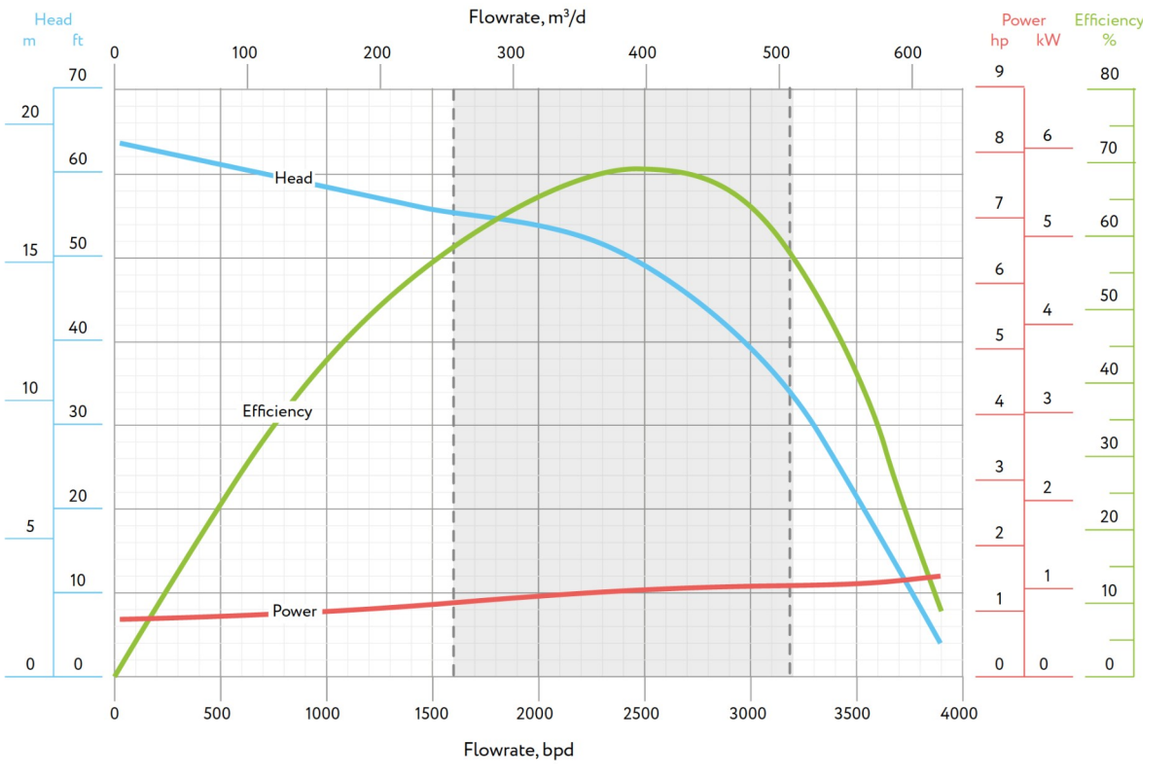
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	31	10.5	3.202	344	156
4M	42	13.8	4.202	463	210
5M	54	17.1	5.202	576	261

ESP-OS A 535-2500

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



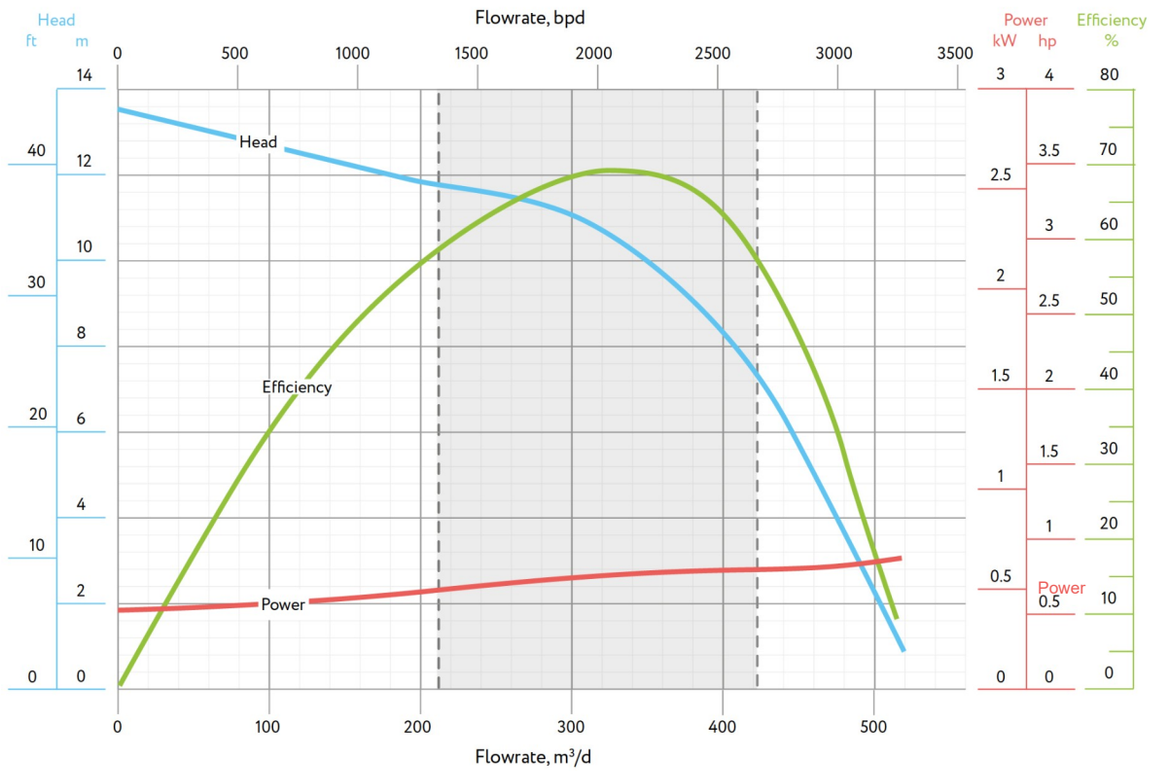
TECHNICAL DATA

60 HZ-3,500 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		69 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	2,526 bpd	402 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	1,600 - 3,200 bpd	254 - 509 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	49.1 ft	15.0 m
Shaft limit	standard (direct start)	298 hp	222 kW		power	1.330 hp	0.991 kW
	high-strength (soft start)	550 hp	410 kW		rotational direction	CCW	

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



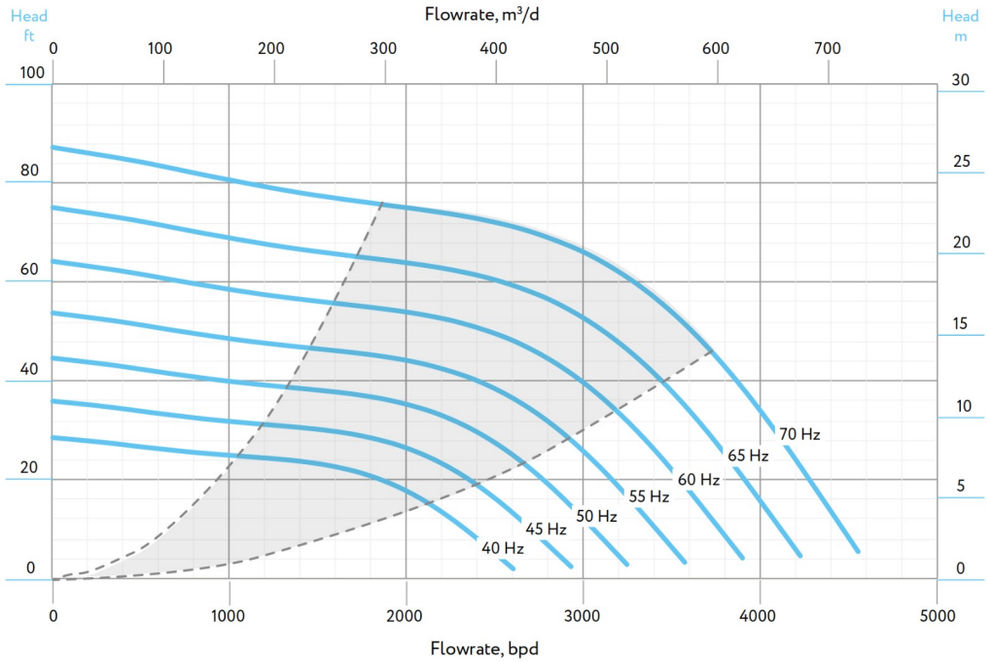
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		69 %	
	housing pressure limit	6,000 psi	414 bar	Pump	optimum flow rate	2,100 bpd	334 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	1,333 - 2,667 bpd	212 - 423 m^3/d
	shaft cross-sectional area	0.589 in^2	380.13 mm^2	Stage	head	34.0 ft	10.4 m
Shaft limit	standard (direct start)	248 hp	185 kW		power	0.765 hp	0.570 kW
	high-strength (soft start)	459 hp	342 kW		rotational direction	CCW	

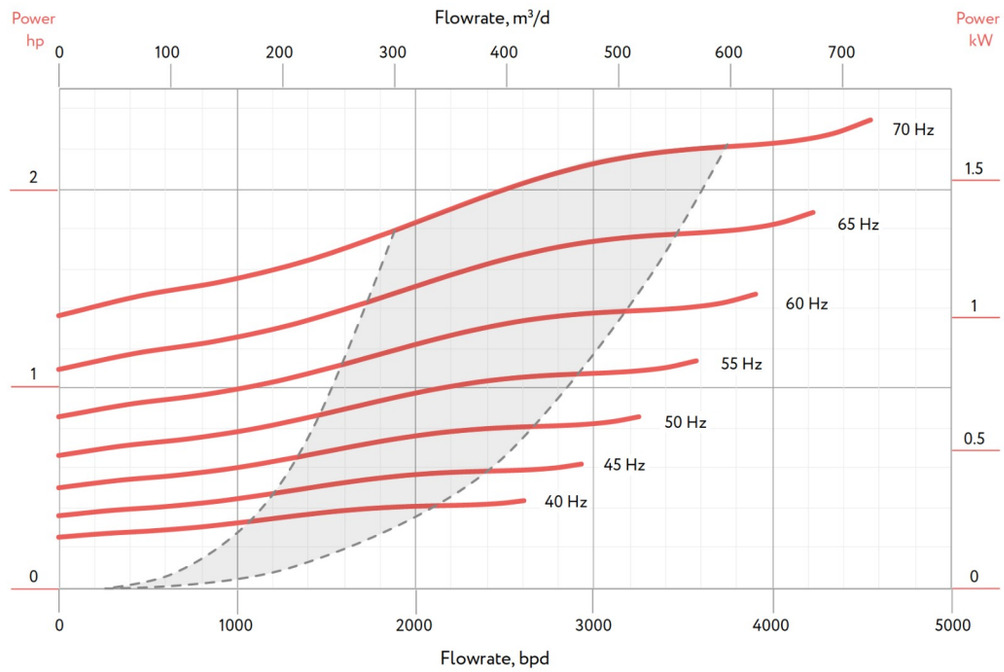
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



quality integrity innovations

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	80	11.070	3.374	518	235
3.5M	94	12.711	3.874	591	268
4M	107	14.351	4.374	650	295
4.5M	121	15.992	4.874	708	321
5M	135	17.632	5.374	783	355
5.5M	149	19.273	5.874	842	382
6M	163	20.913	6.374	904	410

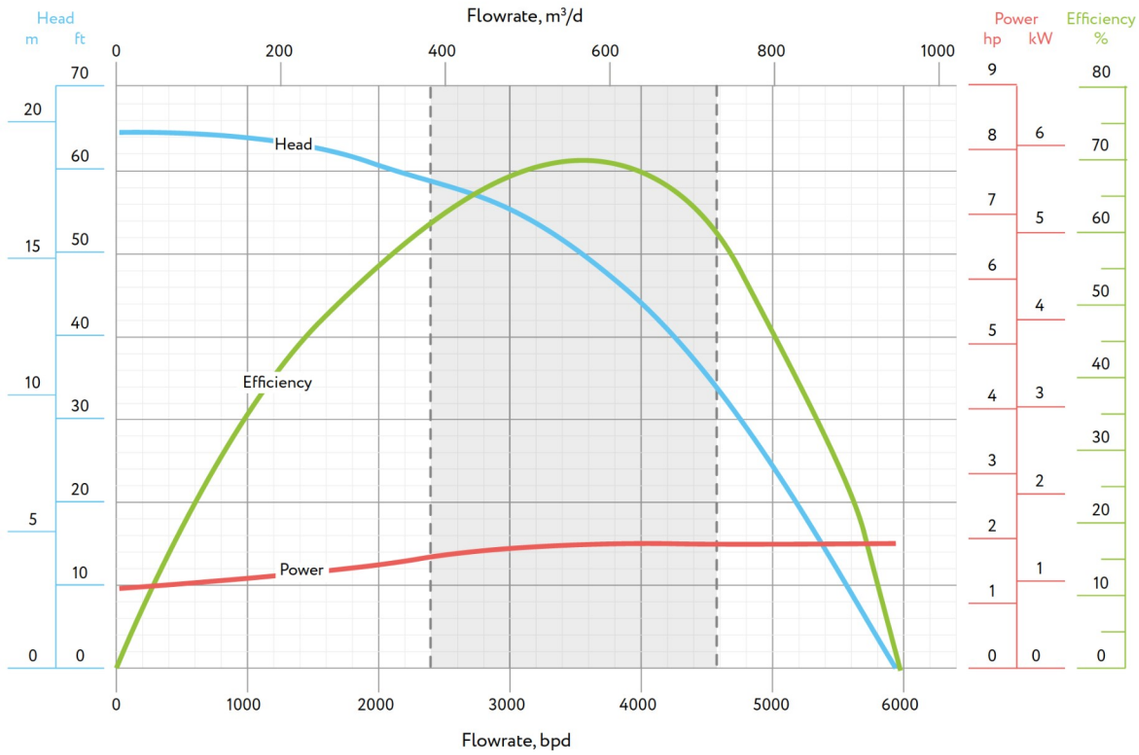
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	81	11.070	3.374	520	236
3.5M	95	12.711	3.874	589	267
4M	108	14.351	4.374	593	269
4.5M	123	15.992	4.874	710	322
5M	137	17.632	5.374	787	357
5.5M	151	19.273	5.874	844	383
6M	165	20.913	6.374	908	412

ESP-OS A 535-3500

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

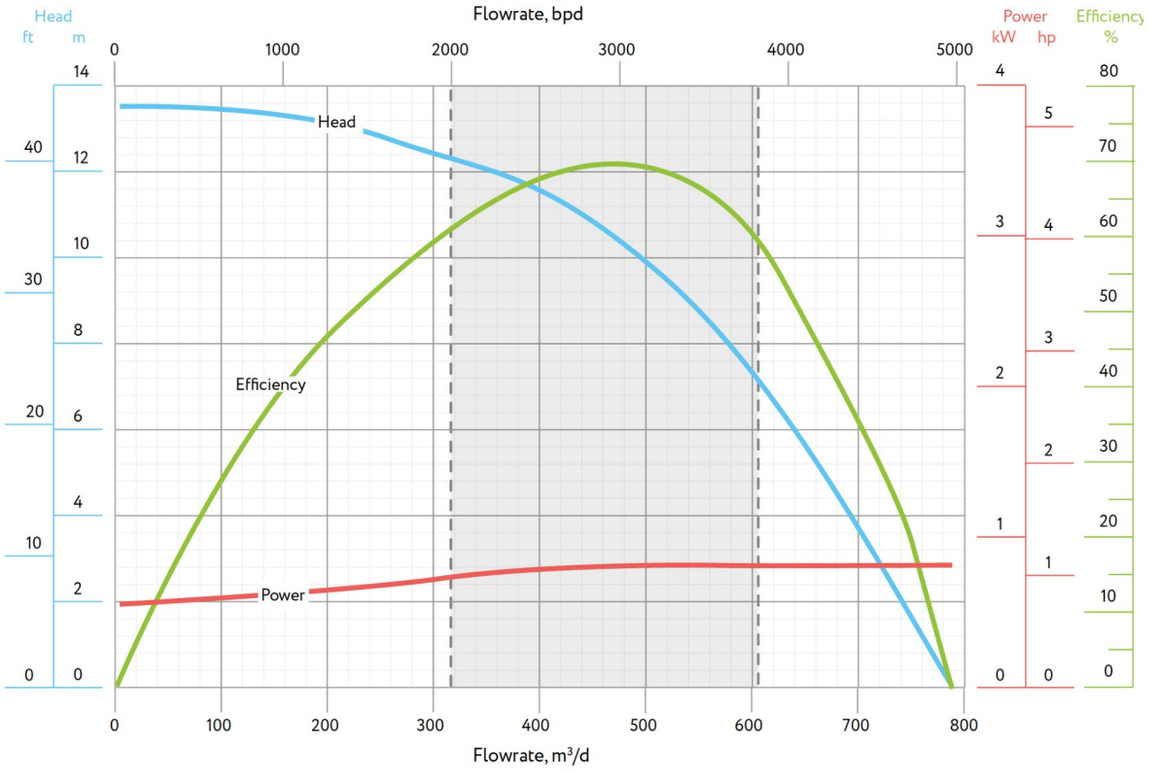
60 HZ-3,500 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		70 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	3,609 bpd	574 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	2,400 – 4,600 bpd	382 - 731 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	49.4 ft	15.1 m
Shaft limit	standard (direct start)	298 hp	222 kW		power	1.884 hp	1.403 kW
	high-strength (soft start)	550 hp	410 kW		rotational direction	CCW	

535 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



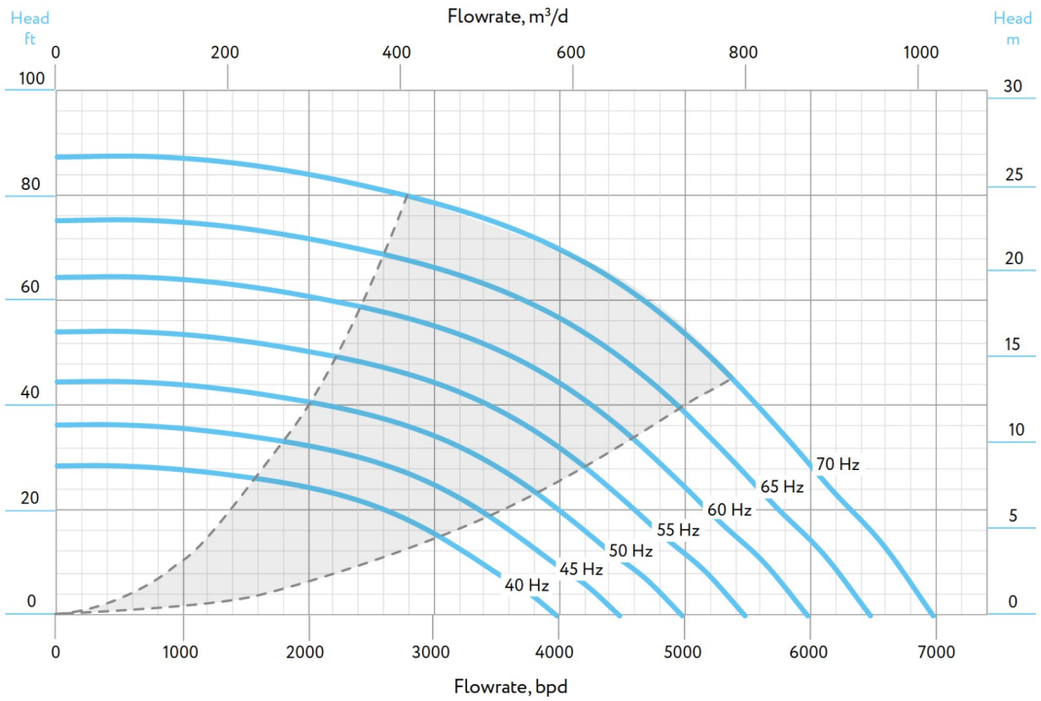
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		70 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	3,008 bpd	478 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	2,000 - 3,834 bpd	318 - 610 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	34.3 ft	10.5 m
Shaft limit	standard (direct start)	248 hp	185 kW		power	1.091 hp	0.812 kW
	high-strength (soft start)	459 hp	342 kW		rotational direction	CCW	

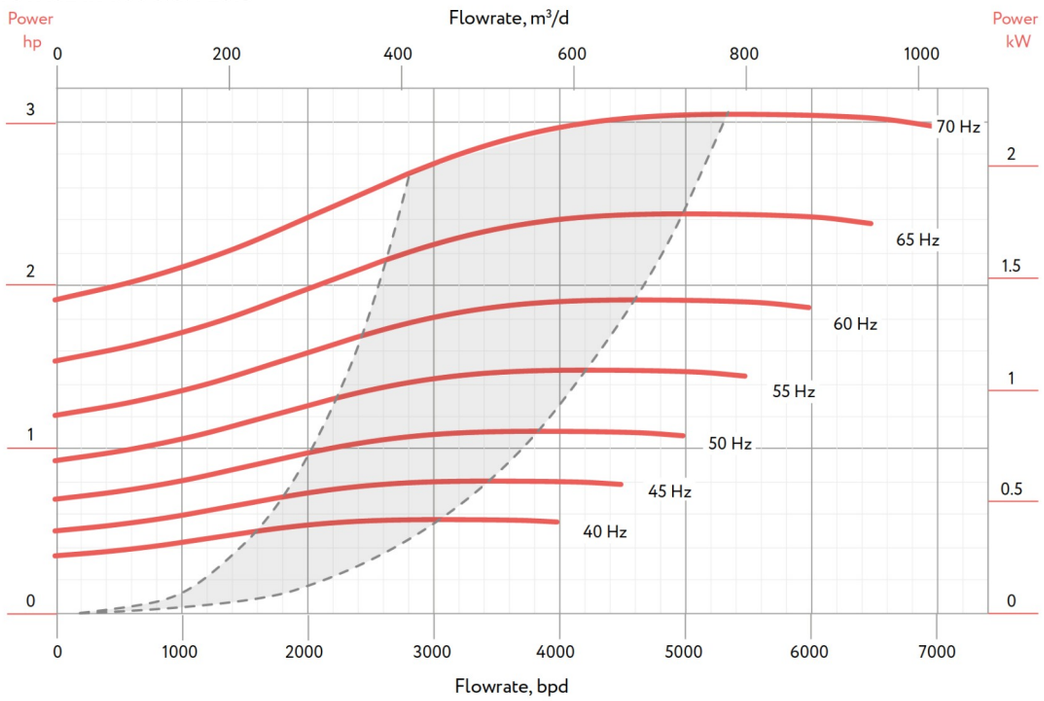
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



quality integrity innovations

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	60	11.070	3.374	534	242
3.5M	69	12.711	3.874	597	271
4M	87	14.351	4.374	659	299
4.5M	96	15.992	4.874	721	327
5M	113	17.632	5.374	783	355
5.5M	122	19.273	5.874	842	382

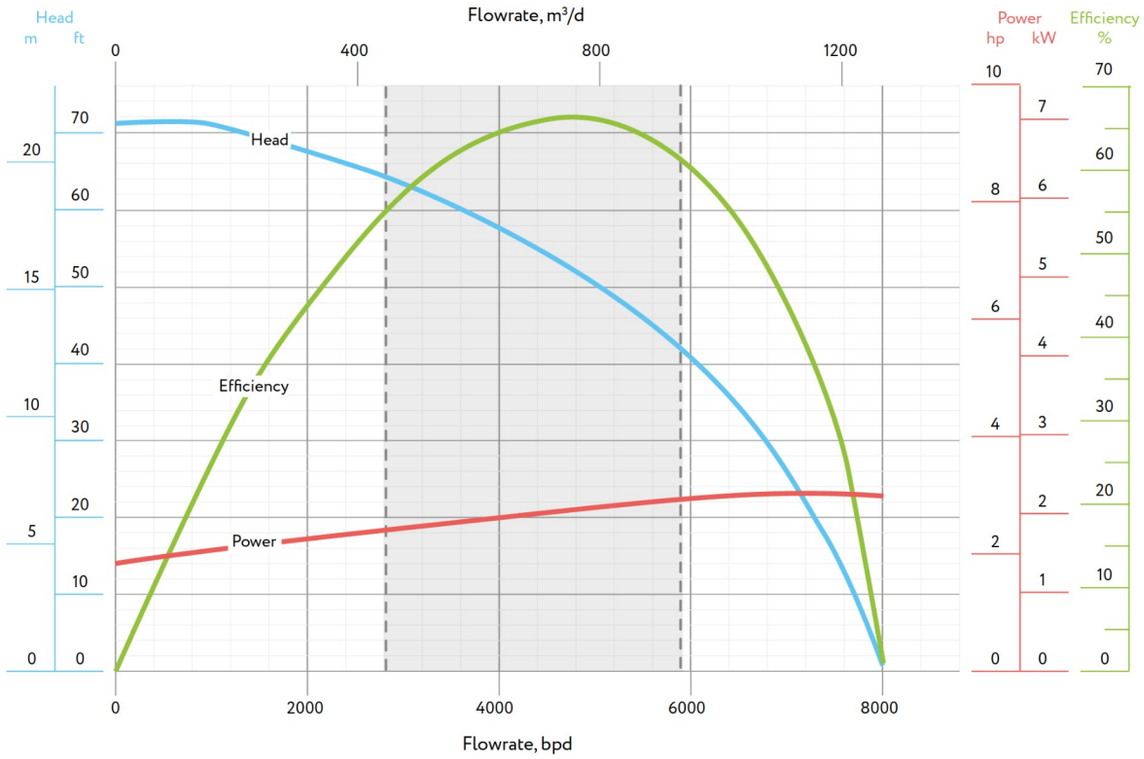
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	61	11.070	3.374	536	243
3.5M	70	12.711	3.874	600	272
4M	88	14.351	4.374	661	300
4.5M	97	15.992	4.874	723	328
5M	114	17.632	5.374	785	356
5.5M	123	19.273	5.874	789	358
6M	132	20.913	6.374	906	411

ESP-OS A 535-4700

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

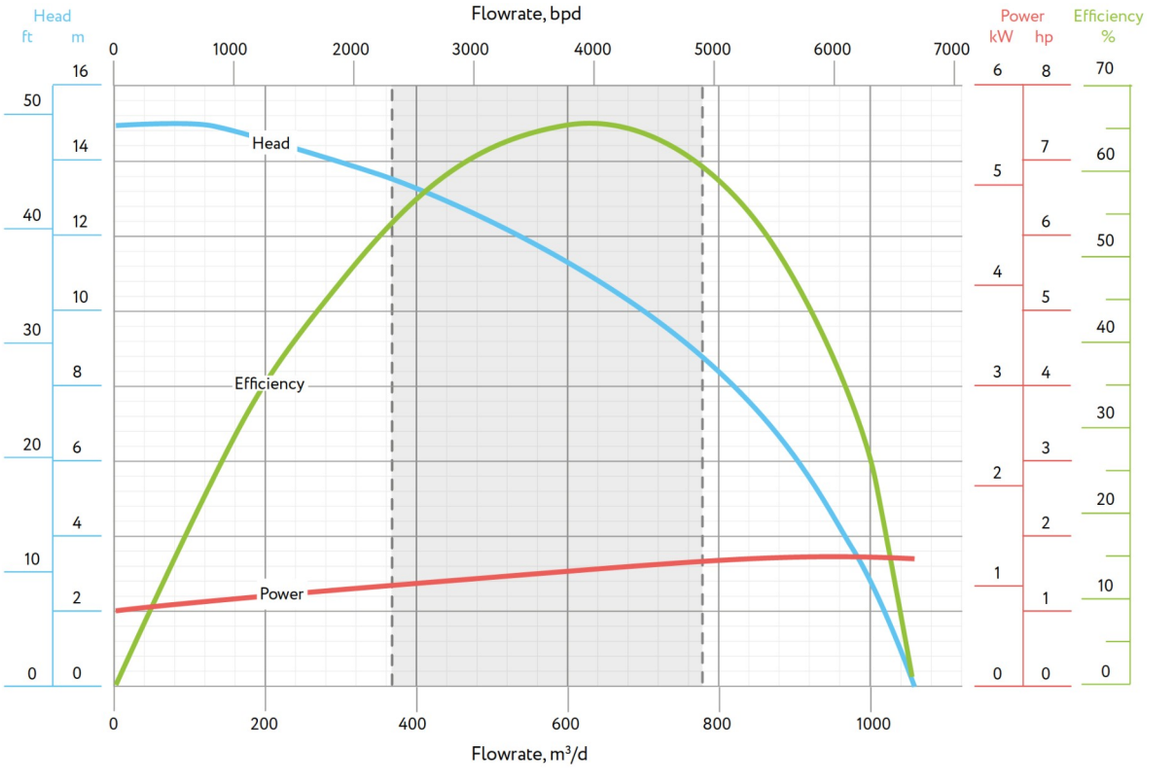
60 HZ-3,500 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		66 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	4,771 bpd	759 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	2,800 - 5,900 bpd	445 - 938 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	52.3 ft	15.9 m
Shaft limit	standard (direct start)	298 hp	222 kW		power	2.792 hp	2.080 kW
	high-strength (soft start)	550 hp	410 kW		rotational direction	CCW	

535 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



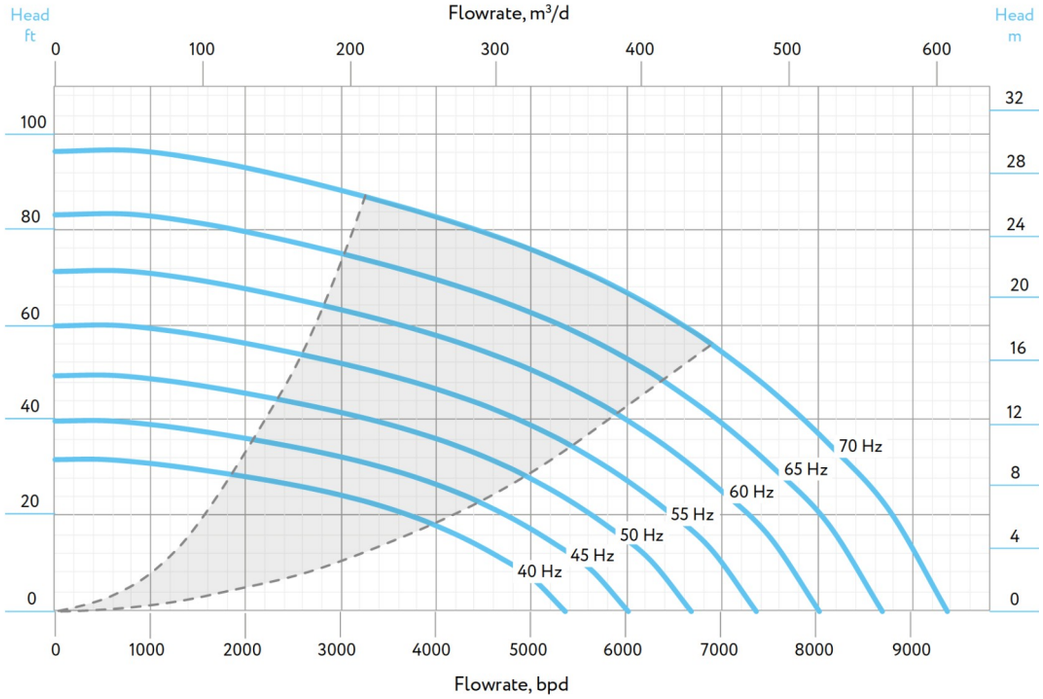
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		66 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	3,976 bpd	632 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	2,334 - 4,917 bpd	371 - 782 m^3/d
	shaft cross-sectional area	0.589 in^2	380.13 mm^2	**Stage**	head	36.3 ft	11.1 m
Shaft limit	standard (direct start)	248 hp	185 kW		power	1.616 hp	1.204 kW
	high-strength (soft start)	459 hp	342 kW		rotational direction	CCW	

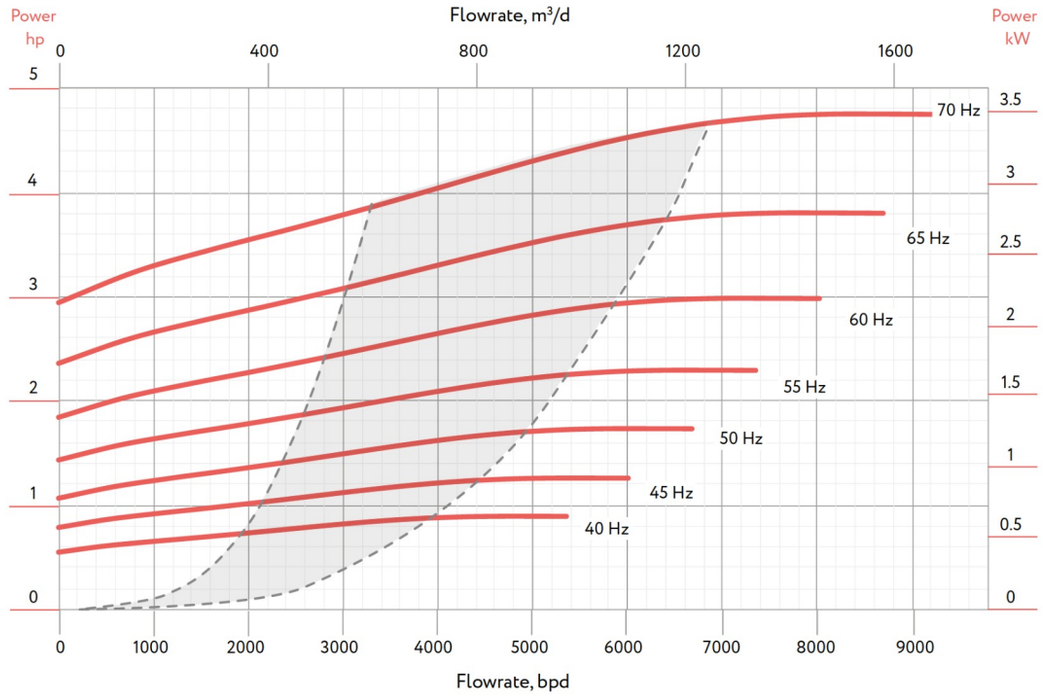
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



quality integrity innovations

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	41	11.070	3.374	538	244
3.5M	48	12.711	3.874	613	278
4M	57	14.351	4.374	705	320
4.5M	67	15.992	4.874	758	344
5M	73	17.632	5.374	825	374
5.5M	81	19.273	5.874	895	406

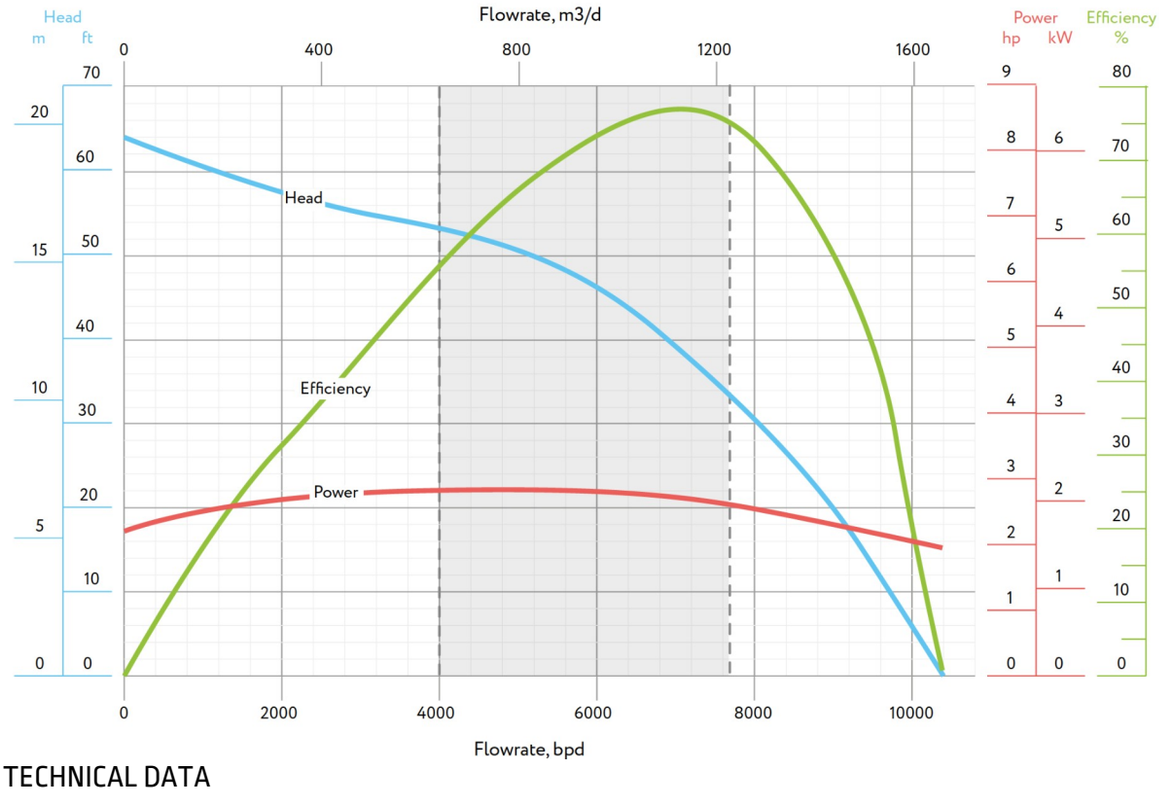
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	42	11.070	3.374	540	245
3.5M	49	12.711	3.874	615	279
4M	59	14.351	4.374	708	321
4.5M	68	15.992	4.874	761	345
5M	74	17.632	5.374	827	375
5.5M	81	19.273	5.874	897	407
6M	87	20.913	6.374	972	441

ESP-OS A 535-7000

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

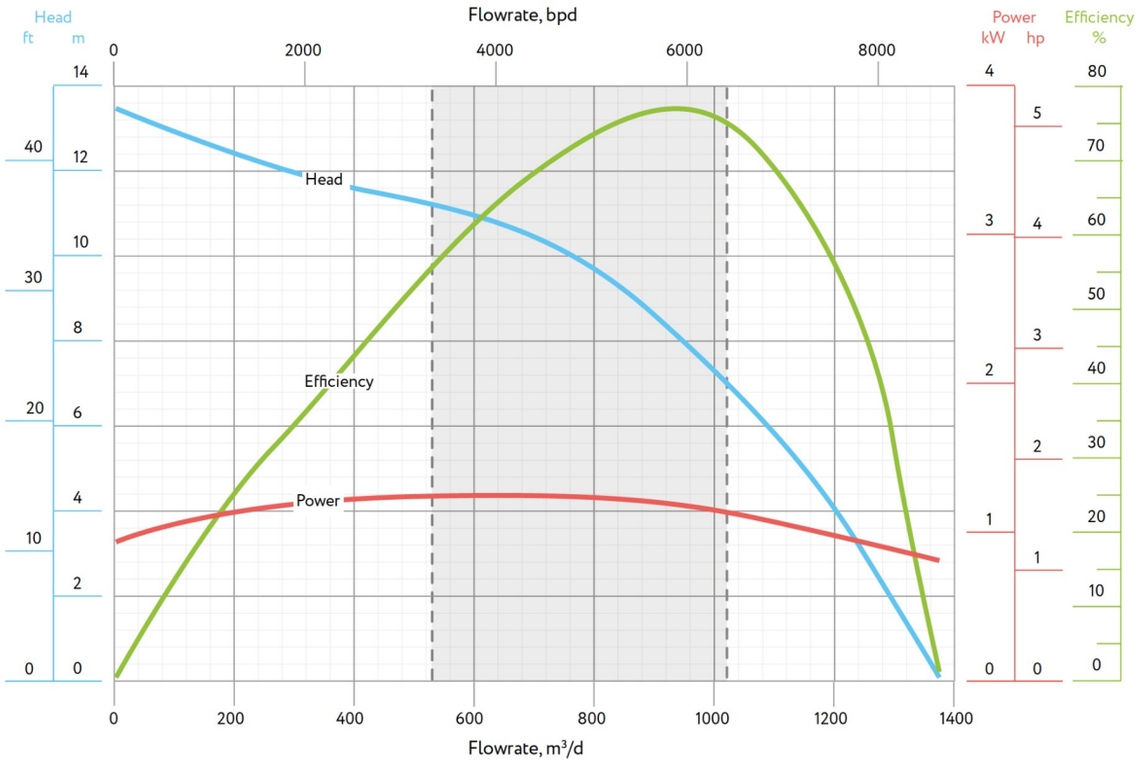
60 HZ-3,500 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		76 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	6,989 bpd	1,111 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	4,000 - 7,700 bpd	636 - 1,224 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	39.5 ft	12.0 m
Shaft limit	standard (direct start)	298 hp	222 kW		power	2.668 hp	1.988 kW
	high-strength (soft start)	550 hp	410 kW		rotational direction	CCW	

535 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



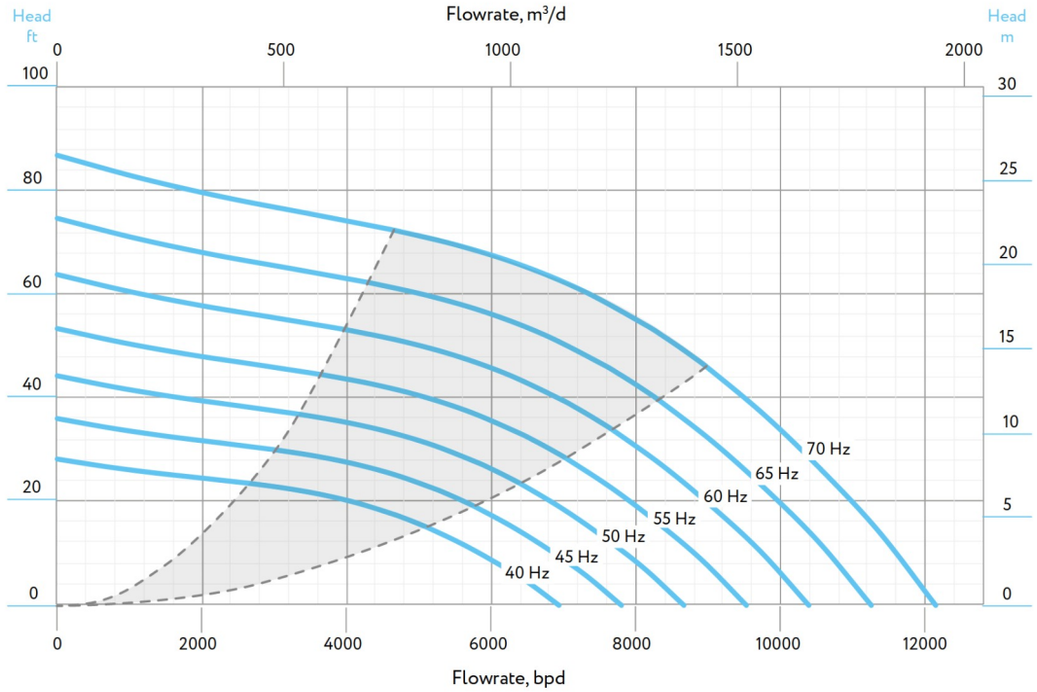
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		76 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	5,825 bpd	926 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	3,334 - 6,417 bpd	530 - 1,020 m^3/d
	shaft cross-sectional area	0.589 in^2	380.13 mm^2	**Stage**	head	27.4 ft	8.4 m
Shaft limit	standard (direct start)	248 hp	185 kW		power	1.545 hp	1.151 kW
	high-strength (soft start)	459 hp	342 kW		rotational direction	CCW	

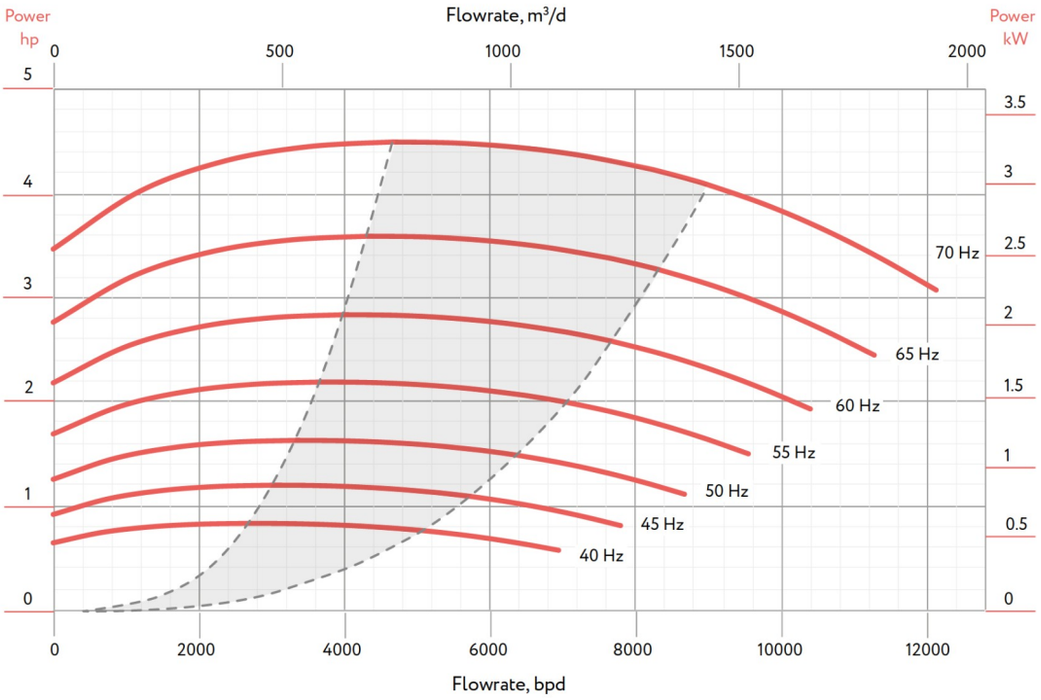
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



quality integrity innovations

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	37	11.070	3.374	547	248
3.5M	43	12.711	3.874	622	282
4M	52	14.351	4.374	717	325
4.5M	59	15.992	4.874	1054	478
5M	64	17.632	5.374	904	410
5.5M	70	19.273	5.874	979	444

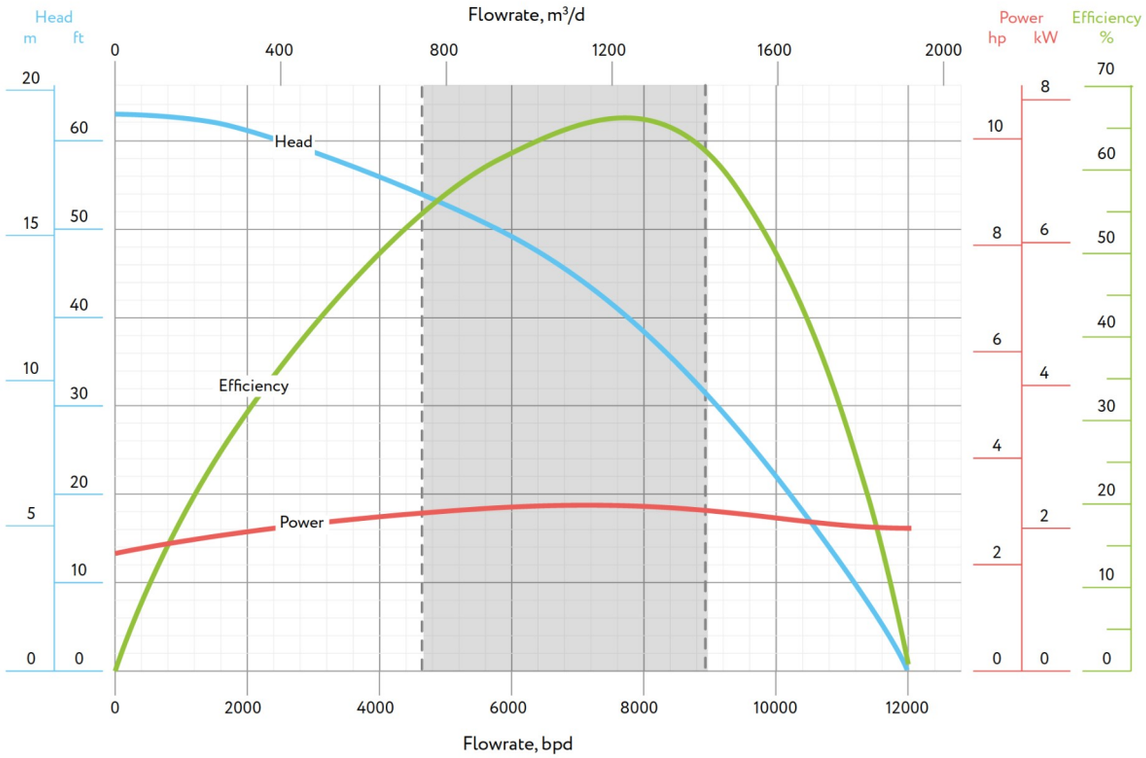
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	37	11.070	3.374	547	248
3.5M	43	12.711	3.874	622	282
4M	52	14.351	4.374	717	325
4.5M	59	15.992	4.874	1054	478
5M	64	17.632	5.374	904	410
5.5M	70	19.273	5.874	979	444
6M	75	20.913	6.374	1047	475

ESP-OS A 535-7500

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

60 HZ-3,500 RPM

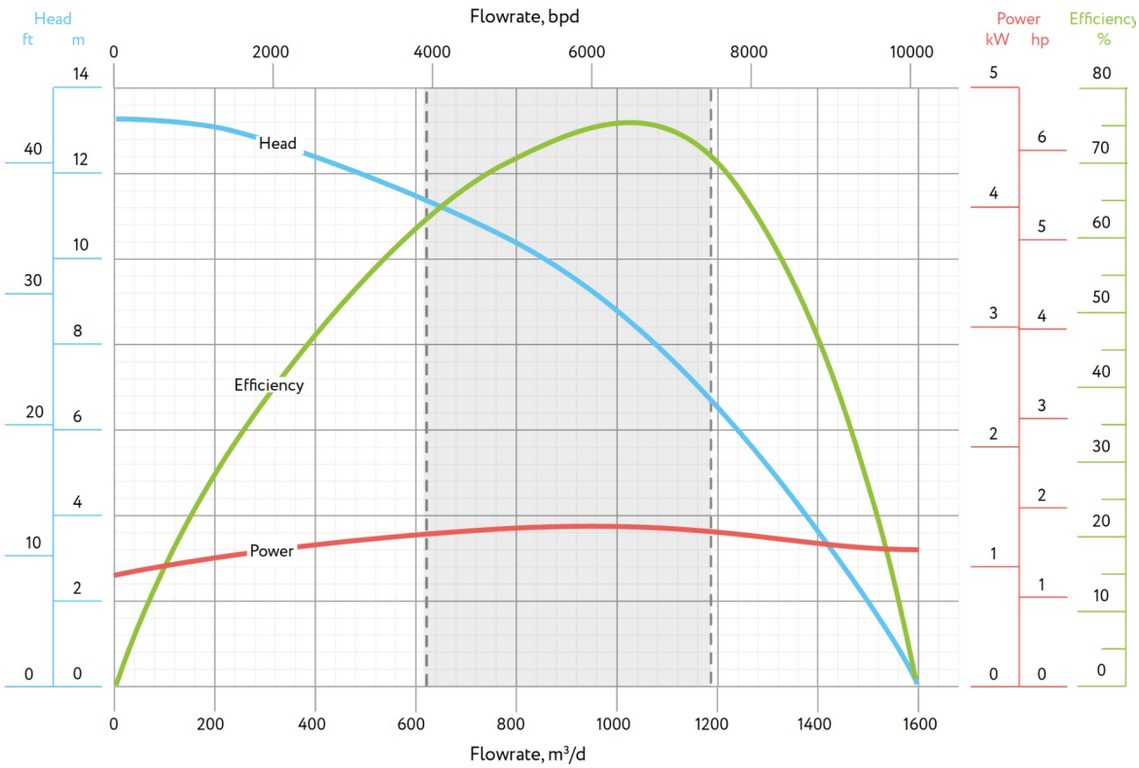
Housing	outer diameter	5.35 in.	136 mm	Best efficiency		75 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	7,651 bpd	1,217 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	4,700 - 9,000 bpd	747 – 1,431 m^3/d
	shaft cross-sectional area	0.589 $in.^2$	380.13 mm^2	**Stage**	head	41.1 ft	12.5 m
Shaft limit	standard (direct start)	298 hp	222 kW		power	3.076 hp	2.292 kW
	high-strength (soft start)	550 hp	410 kW		rotational direction	CCW	

quality integrity innovations

535 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



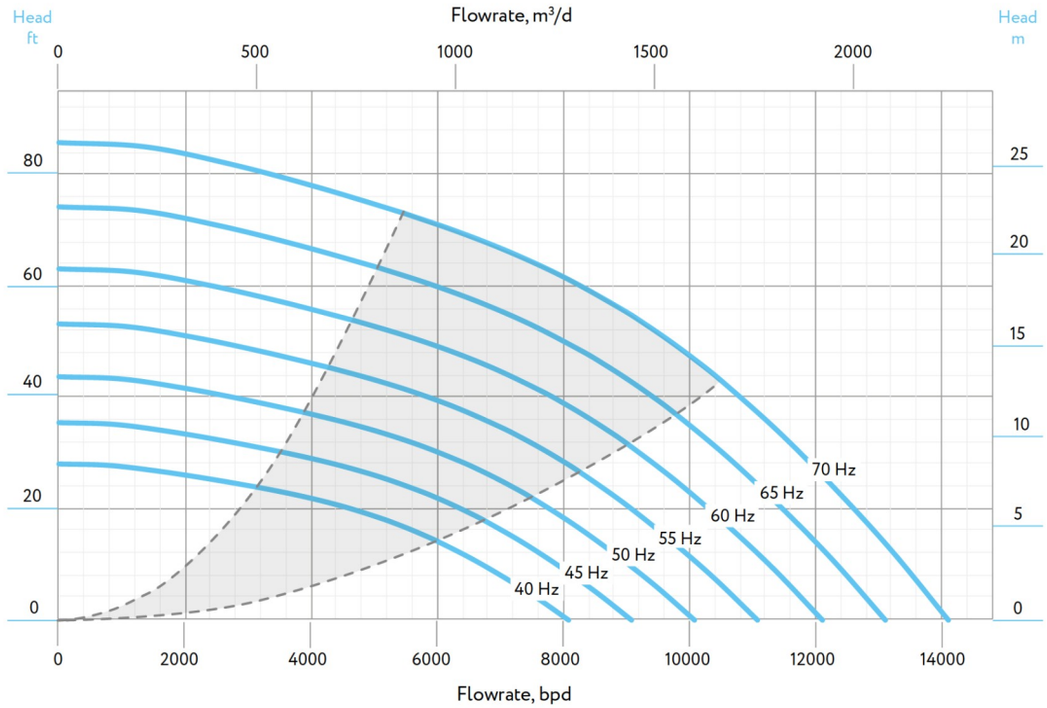
TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		75 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	6,377 bpd	1,014 m^3/d
Shaft	diameter	0.866 in.	22.0 mm		recommended operating range	3,917 - 7,501 bpd	623 - 1,193 m^3/d
	shaft cross-sectional area	0.589 in^2	380.13 mm^2	**Stage**	head	28.5 ft	8.7 m
Shaft limit	standard (direct start)	248 hp	185 kW		power	1.781 hp	1.327 kW
	high-strength (soft start)	459 hp	342 kW		rotational direction	CCW	

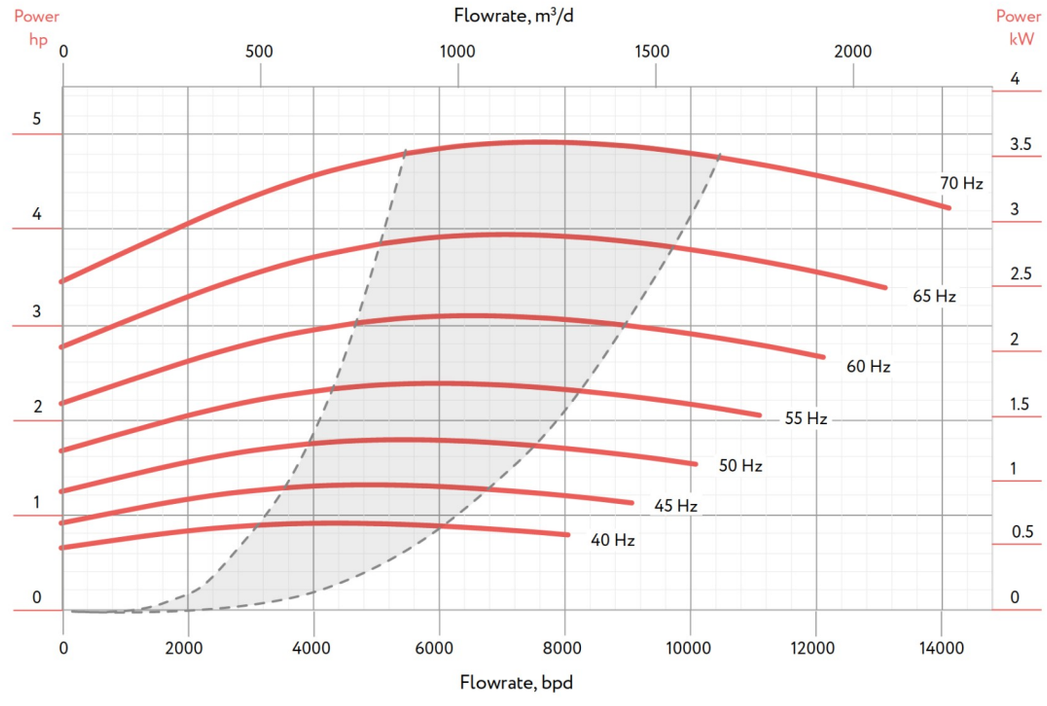
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



535 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	35	11.070	3.374	545	247
3.5M	41	12.711	3.874	619	281
4M	50	14.351	4.374	714	324
4.5M	58	15.992	4.874	1052	477
5M	63	17.632	5.374	902	409
5.5M	69	19.273	5.874	977	443

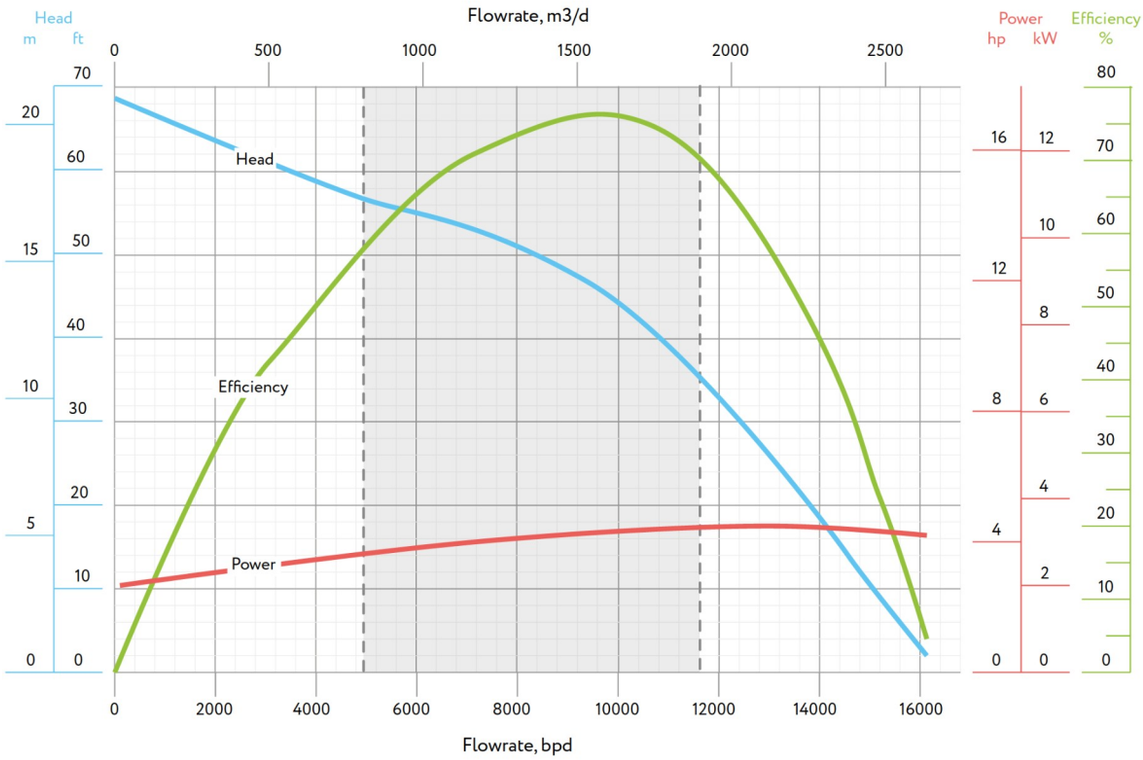
FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	35	11.070	3.374	545	247
3.5M	41	12.711	3.874	619	281
4M	50	14.351	4.374	714	324
4.5M	58	15.992	4.874	1052	477
5M	63	17.632	5.374	902	409
5.5M	69	19.273	5.874	977	443
6M	74	20.913	6.374	1045	474

ESP-OS A 535-10000

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 60 HZ



TECHNICAL DATA

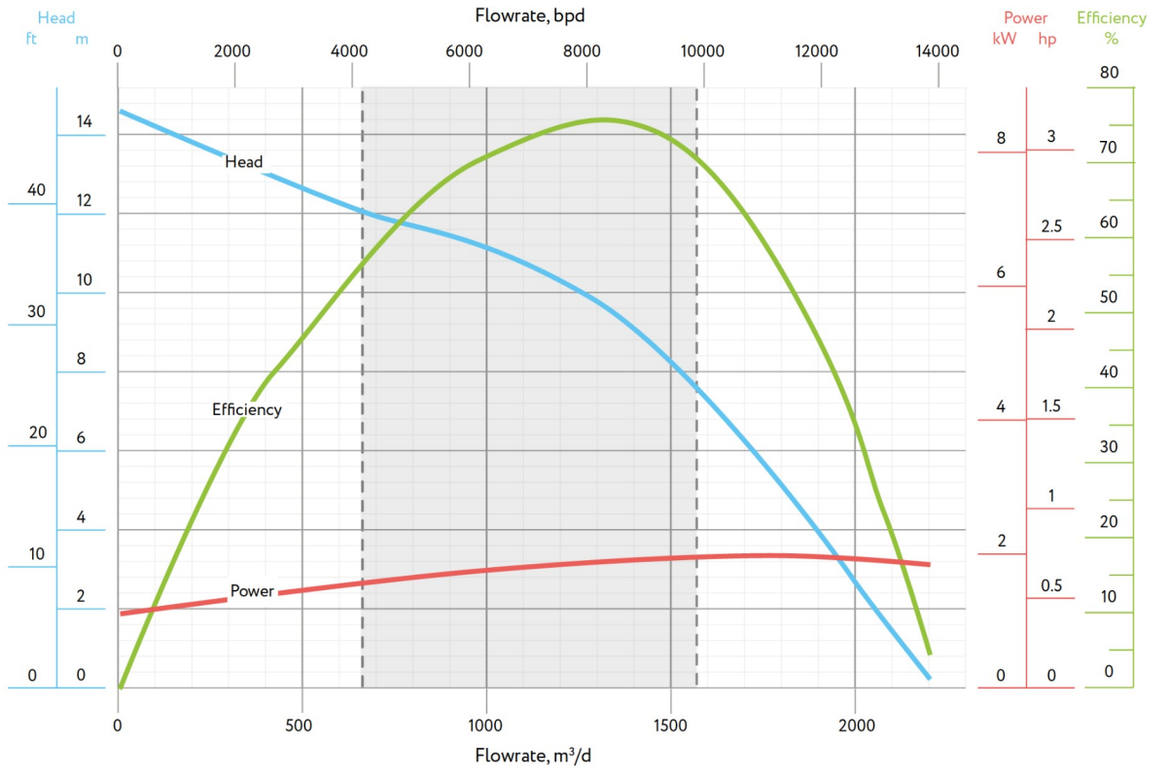
60 HZ-3,500 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		76 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	9,765 bpd	1,553 m^3/d
Shaft	diameter	1.181 in.	30.0 mm		recommended operating range	5,000 - 11,900 bpd	795 - 1,892 m^3/d
	shaft cross-sectional area	1.096 $in.^2$	706.86 mm^2	**Stage**	head	46.0 ft	14.0 m
Shaft limit	standard (direct start)	721 hp	530 kW		power	4.359 hp	3.247 kW
	high-strength (soft start)	1319 hp	970 kW		rotational direction	CCW	

535 SERIES PUMPS

PUMP PERFORMANCE CURVE

1 STAGE IN 1.00 S.G. FLUID @ 50 HZ



TECHNICAL DATA

50 HZ-2,917 RPM

Housing	outer diameter	5.35 in.	136 mm	Best efficiency		76 %	
	housing pressure limit	6,000 psi	414 bar	**Pump**	optimum flow rate	8,138 bpd	1,294 m^3/d
Shaft	diameter	1.181 in.	30.0 mm		recommended operating range	4,167 - 9,918 bpd	663 - 1,577 m^3/d
	shaft cross-sectional area	1.096 in^2	706.86 mm^2	**Stage**	head	31.9 ft	9.7 m
Shaft limit	standard (direct start)	601 hp	442 kW		power	2.523 hp	1.880 kW
	high-strength (soft start)	1099 hp	808 kW		rotational direction	CCW	

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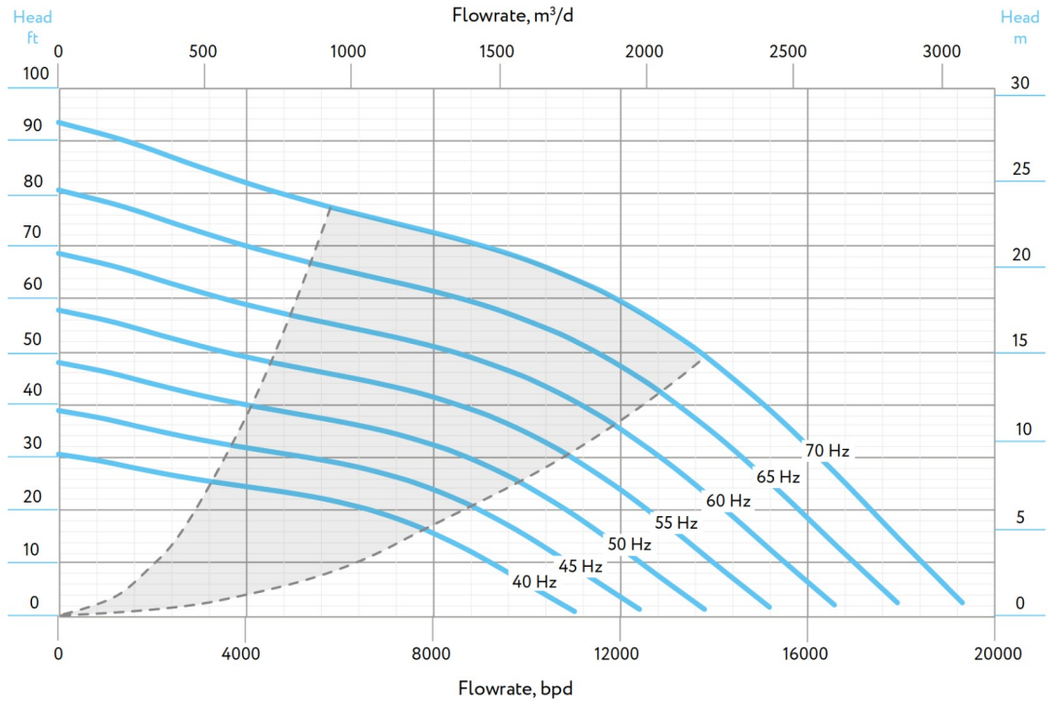
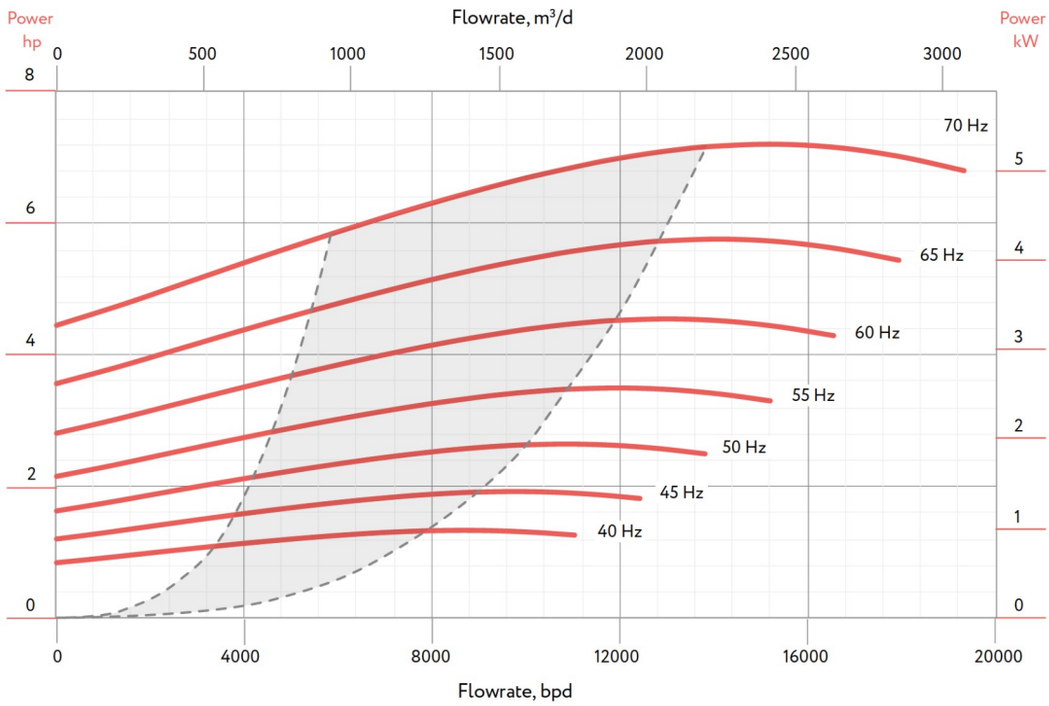
MULTI-FREQUENCY PUMP CURVE - HEAD

1 STAGE IN 1.00 S.G. FLUID



MULTI-FREQUENCY PUMP CURVE - POWER

1 STAGE IN 1.00 S.G. FLUID



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535 SERIES PUMPS

COMPRESSION PUMPS

Housing	Abrasion Resistant Pump (TT3)	Length		Weight	
	stages	ft	m	lb	kg
3M	33	11.070	3.374	547	248
3.5M	38	12.711	3.874	622	282
4M	46	14.351	4.374	717	325
4.5M	52	15.992	4.874	767	348
5M	57	17.632	5.374	833	378
5.5M	62	19.273	5.874	904	410

FLOATER PUMPS

Housing	Abrasion Resistant Pump (TT2)	Length		Weight	
	stages	ft	m	lb	kg
3M	33	11.070	3.374	547	248
3.5M	38	12.711	3.874	622	282
4M	46	14.351	4.374	717	325
4.5M	52	15.992	4.874	767	348
5M	57	17.632	5.374	833	378
5.5M	62	19.273	5.874	904	410
6M	67	20.913	6.374	979	444

GAS-HANDLING SYSTEMS

Gas-handling systems (Gas separators, gas handlers, gas separator-handlers and multiphase gas handler) are designed to ensure the stable operation of submersible pumps in wells with a high content of gas.

APPLICATION

· Wells with high GOR;

· Wells with unstable inflow;

· Shale wells.

FEATURES & BENEFITS

· Gas-handling systems have a corrosion-wear-resistant design;

· The liner of the separation chamber is made of thick-walled chromium-nickel stainless steel;

· The rotor is stabilized by wear-resistant radial bearings;

· The radial bearings are made of hard alloy;

· Head, base and liner are made of stainless steel;

· Internal components are made of corrosion-resistant steel and/or of Ni-resist cast iron Type 1;

· Gas separator ensures separation and removal of gas from the fluid into the annulus;

· Gas-handler and Multiphase gas-handler reduce bubble size, put gas back into solution and homogenize the mixture;

· Gas-handling systems with inlets are installed instead of an intake or as the lower section of a tandem gas-handling system. Gas-handling systems with no inlets are installed above the device with inlets.

RECOMMENDED GAS-HANDLING SYSTEM

Free gas at pump intake (after separation), %	Gas-handling system
0 to 10	Radial/mixed flow stage
10 to 25	Mixed flow stage
25 to 55	Gas-handler
55 to 75	Multiphase gas-handler

To increase the efficiency of ESP operation in wells with a particularly high content of gas, gas-handling systems are installed according to the following arrangements:

· At the top: multiphase gas handler/gas handling device;

· At the bottom: gas separator and gas handling device.

GAS SEPARATORS

EXAMPLE

GS-OS A V 338-950 CT STD CR1 AFL

GS-	OS	A	V	338-	950	CT	STD	CR1	HSN
1	1.1	2	3	4	5	6	7	8	9

1	Gas separator
1.1	Brand name - Oiltechsystems
2	Alnas design
3	Gas Separator type V - vortex R - rotary
4	Gas separator series
5	Maximum capacity, bpd(g)60Hz
6	Gas separator configuration CT - central tandem LT - Lower tandem (can be used as single)
7	Shaft rating STD - standard strength shaft HSS - high strength shaft USS - ultrahigh strength shaft
8	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
9	Elastomers material: HSN - highly saturated nitrile AFL - high temperature fluoroelastomer

ROTARY GAS SEPARATORS

The principle of operation of a rotary gas separator is based on the centrifugal force arising in the separation chamber to remove free gas into the annulus, thereby ensuring stable operation of the pump and increasing MTBF.

APPLICATION

· Wells with Increased fluid viscosity;
· Wells with Low and medium solids content.

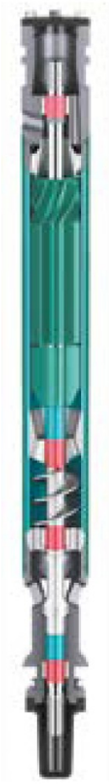
FEATURES & BENEFITS

· The liner of the separation chamber is made of thick-walled chromium-nickel stainless steel;
· The rotor is stabilized by wear-resistant radial bearings;
· The base of the gas separator is made of stainless steel.

A rotary gas separator with intake holes is installed instead of an intake section or as the lower section of a tandem rotary gas separator/gas-handling system.
A rotary gas separator without intake holes is installed above the device with intake holes or as the upper section of a tandem rotary gas separator.

Description	Recommended Operating Range		Housing diameter		Shaft		Length		Weight	
	bpd @ 60 Hz	m3/d @ 50 Hz	in.	mm	in.	mm	ft	m	lb	kg
GS-OS A R 338-1500 CT	151 - 1,509	20 - 200	3.39	86	0.67	17	2.2	0.7	46	21
GS-OS A R 338-1500 LT	151 - 1,509	20 - 200	3.39	86	0.67	17	2.6	0.8	53	24
GS-OS A R 362-500 CT	60 - 453	8 - 60	3.62	92	0.787	20	2.4	0.7	60	27
GS-OS A R 362-500 LT	60 - 453	8 - 60	3.62	92	0.787	20	2.8	0.9	64	29
GS-OS A R 362-1300 CT	377 - 1,283	50 - 170	3.62	92	0.787	20	2.4	0.7	60	27
GS-OS A R 362-1300 LT	377 - 1,283	50 - 170	3.62	92	0.787	20	2.8	0.9	64	29
GS-OS A R 362-2100 CT	113 - 2,113	15 - 280	3.62	92	0.787	20	2.4	0.7	60	27
GS-OS A R 362-2100 LT	113 - 2,113	15 - 280	3.62	92	0.787	20	2.8	0.9	64	29
GS-OS A R 406-4500 CT	189 - 4,528	25 - 600	4.06	103	0.866	22	3.2	1.0	78	36
GS-OS A R 406-4500 LT	189 - 4,528	25 - 600	4.06	103	0.866	22	3.6	1.1	87	39

VORTEX GAS SEPARATORS



The principle of operation of the vortex gas separator is based on the effect of a free vortex arising in the vortex chamber and providing phase separation under the action of centrifugal forces.

The vortex gas separator is Less susceptible to cyclic circular wear of the liner by solids due to the absence of separation drums. It is used in wells with a high content of solids.

APPLICATION

· Wells with a high GOR;
· Wells with a high content of solids.

FEATURES & BENEFITS

· The Liner of the separation chamber is made of thick-walled chromium-nickel stainless steel;
· The rotor is stabilized by wear-resistant radial bearings;
· End pieces are made of stainless steel;
· A vortex gas separator with intake holes is installed instead of an intake section or as the lower section of a tandem vortex gas separator/gas-handling system.
· A vortex gas separator without intake holes is installed above the device with intake holes or as the upper section of a tandem vortex gas separator.

Description	Recommended Operating Range		Housing diameter		Shaft		Length		Weight	
	bpd @ 60 Hz	m3/d @ 50 Hz	in.	mm	in.	mm	ft	m	lb	kg
GS-OS A V 362-500 CT	60 - 453	8 - 60	3.62	92	0.787	20	2.4	0.7	55	25
GS-OS A V 362-500 LT	60 - 453	8 - 60	3.62	92	0.787	20	2.8	0.9	60	27
GS-OS A V 362-2100 CT	113 - 2,113	15 - 280	3.62	92	0.787	20	2.4	0.7	55	25
GS-OS A V 362-2100 LT	113 - 2,113	15 - 280	3.62	92	0.787	20	2.8	0.9	60	27
GS-OS A V 362-1300 CT	377 - 1,283	50 - 170	3.62	92	0.787	20	2.4	0.7	55	25
GS-OS A V 362-1300 LT	377 - 1,283	50 - 170	3.62	92	0.787	20	2.4	0.7	55	25
GS-OS A V 406-2100 CT	113 - 2,114	15 - 280	4.06	103	0.984	25	3.36	1.0	80	37
GS-OS A V 406-2100 LT	113 - 2,114	15 - 280	4.06	103	0.984	25	2.94	0.9	69	32
GS-OS A V 406-7200 CT	189 - 7,173	25 - 950	4.06	103	0.984	25	3.36	1.0	80	37
GS-OS A V 406-7200 LT	189 - 7,173	25 - 950	4.06	103	0.984	25	3.36	1.0	80	37

ADVANCED GAS HANDLER

The gas-handler reduces bubbles size, put gas back into solution and homogenize the mixture.

The gas-liquid mixture ensures the stable operation of the pump and reduces its vibration, also creates an additional pressure head due to the gas-lift effect in the tubing. When the fluid rises along the tubing, free gas is released from the formation fluid, which, when expanding, additionally Lifts the fluid.

FEATURES & BENEFITS

· The gas lift effect increases the efficiency of well operation;
· Stabilizes characteristics of the pump and preventes pump starvation;
· Reduces pulsation and vibration of the fluid flow in the tubing with an increased gas content at the inlet;
· Preventes gas accumulation in the annulus;
· The rotor is stabilized by wear-resistant radial bearings;
· The base of the gas handler is made of stainless steel.

EXAMPLE

AGH-OS A 362-1300 LT HSS CR1 AFL

AGH-	OS	A	362-	1300	LT	HSS	CR1	AFL
1	1.1	2	3	4	5	6	7	8

1	Advanced Gas Handler
1.1	Brand name - Oiltechsystems
2	Alnas design
3	AGH series
4	Maximum flow rate @ 60Hz, bpd
5	AGH configuration CT - central tandem LT - Lower tandem
6	Shaft rating STD - standard strength shaft HSS - high strength shaft USS - ultrahigh strength shaft
7	Corrosion resistance design: CRO - 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
8	Elastomers material: HSN - highly saturated nitrile AFL - high temperature fluoroelastomer

ADVANCED GAS HANDLER

Description	Recommended Operating Range		Housing diameter		Shaft		Length		Weight	
	bpd @ 60 Hz	m3/d @ 50 Hz	in.	mm	in.	mm	ft	m	lb	kg
AGH-OS A 362-2100 CT	91 - 2,113	12 - 280	3.62	92	0.787	20	2.2	0.7	53	24
AGH-OS A 362-2100 LT	91 - 2,113	12 - 280	3.62	92	0.787	20	2.6	0.8	57	26
AGH-OS A 406-4500 CT	189 - 4,528	25 - 600	4.06	103	0.866	22	2.2	0.7	44	20
AGH-OS A 406-4500 LT	189 - 4,528	25 - 600	4.06	103	0.866	22	2.6	0.8	51	23

GAS SEPARATOR-HANDLER

A rotary gas separator and handler are installed in tandem at the pump intake in wells with a particularly high GOR where neither a gas separator nor a gas handler can ensure stable operation of a submersible centrifugal pump.

A rotary gas separator-handler is a system in which a gas separator is installed at the bottom, while the gas handler is installed on the top.

FEATURES & BENEFITS

· The one-piece Liner of the separation chamber is made of thick-walled chromium-nickel stainless steel;
· The dispersing chamber contains a special designed inducer and stages for mixing dissolved gas in the formation fluid, preparing a homogeneous gas-liquid mixture;
· An additional liner is pressed inside the gas separator-handler housing;
· The supercavitating wheel has additional housing protection against solids;
· The rotor is stabilized by wear-resistant radial bearings;
· The base of the gas separator-handler is made of stainless steel.
· A gas separator-handler with intake holes is installed instead of an intake section or as the lower section of a tandem gas-handling system.
· A gas separator-handler without intake holes is installed above the device with intake holes or as the upper section of a tandem gas-handling system.

EXAMPLE

GSH-OS A 362-1300 LT STD CR1 HSN

GSH-	OS	A	362-	1300	LT	STD	CR1	HSN
1	1.1	2	3	4	5	6	7	8

1	Gas Separator-Handler (GSH)
1.1	Brand name - Oiltechsystems
2	Alnas design
3	GSH series
4	Maximum flow rate @ 60Hz, bpd
5	Gas separator configuration CT - central tandem LT – Lower tandem (can be used as single)
6	Shaft rating STD - standard strength shaft HSS - high strength shaft USS - ultrahigh strength shaft
7	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
8	Elastomers material: HSN - highly saturated nitrile AFL - high temperature fluoroelastomer

GAS SEPARATOR-HANDLER

Description	Recommended Operating Range		Housing diameter		Shaft		Length		Weight	
	bpd @ 60 Hz	m3/d @ 50 Hz	in.	mm	in.	mm	ft	m	lb	kg
GSH-OS A 338-1500 CT	151-1,509	20-200	3.39	86	0.669	17	3.0	0.9	64	29
GSH-OS A 338-1500 LT	151-1,509	20-200	3.39	86	0.669	17	3.4	1.0	71	32
GSH-OS A 362-2100 CT	113-2,113	15-280	3.62	92	0.787	20	4.1	1.3	93	42
GSH-OS A 362-2100 LT	113-2,113	15-280	3.62	92	0.787	20	4.3	1.3	95	43
GSH-OS A 406-7200 CT	189-7,170	25 - 950	4.06	103	0.984	25	4.9	1.5	106	48
GSH-OS A 406-7200 LT	189-7,170	25 - 950	4.06	103	0.984	25	4.4	1.3	88	40
GSH-OS A 449-11700 CT	189-11,698	600-1,550	4.49	114	1.102	28	5.3	1.6	154	70
GSH-OS A 449-11700 LT	189-11,698	600-1,550	4.49	114	1.102	28	5.3	1.6	154	70

MULTIPHASE GAS-HANDLER

Multiphase gas-handler (MGH), as well as the gas handler, is designed to prepare a homogeneous gas-liquid mixture.

MGH working parts are designed on the basis of serial radial stages with a cut Lower impeller disk (multiphase stages) intended For dispersion, compression, and dissolution of Free gas in the pumped Fluid.

FEATURES & BENEFITS

- The gas lift effect increases the efficiency of well operation;
- Stabilized characteristics of the pump and prevented gas lock;
- Reduced pulsation and vibration of the Fluid Flow in the tubing with a high gas content at the inlet;
- Prevented gas accumulation in the annulus;
- Working stages are designed on the basis of serial stages.

MGH with intake holes is installed instead of intake or as the lower section of a tandem MGH.
MGH without intake holes is installed above the device with intake holes or as the upper section of a tandem MGH/gas-handling system.

EXAMPLE

MGH-OS A 406-1900 LT HSS CR1 AFL

MGH-	OS	A	406-	1900	LT	HSS	CR1	AFL
1	1.1	2	3	4	5	6	7	8

1	Multiphase Gas-Handler
1.1	Brand name - Oiltechsystems
2	Alnas design
3	MGH series
4	Maximum flow rate@60Hz, bpd
5	AGH configuration CT - central tandem LT - lower tandem
6	Shaft rating STD - Standard strength shaft HSS - High strength shaft USS - Ultrahigh strength shaft
7	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
8	Elastomers material: HSN - Highly saturated nitrile AFL - high temperature fluoroelastomer

MULTIPHASE GAS-HANDLER

Description	Recommended Operating Range		Housing diameter		Shaft		Length		Weight	
	bpd @ 60 Hz	m3/d @ 50 Hz	in.	mm	in.	mm	ft	m	lb	kg
MGH-OS A 272-1200 CT	434 – 1,164	69 – 185	2.72	69	0.55	14	2.8	0.9	44	20
MGH-OS A 319-800 CT	340 – 755	45 – 100	3.19	81	0.55	14	2.5	0.8	51	23
MGH-OS A 319-800 LT	340 – 755	45 – 100	3.19	81	0.55	14	3.0	0.9	77	35
MGH-OS A 362-600 CT	113 – 604	15 – 80	3.62	92	0.669	17	2.6	0.8	55	25
MGH-OS A 362-600 LT	113 – 604	15 – 80	3.62	92	0.669	17	3.0	0.9	62	28
MGH-OS A 362-1500 CT	755 – 1,509	100 – 200	3.62	92	0.787	20	2.6	0.8	55	25
MGH-OS A 362-1500 LT	755 – 1,509	100 – 200	3.62	92	0.787	20	3.0	0.9	62	28
MGH-OS A 406-1900 CT	187 – 1,887	25 – 250	4.06	103	0.87	22	2.6	0.8	55	25
MGH-OS A 406-1900 LT	187 – 1,887	25 – 250	4.06	103	0.87	22	3.0	0.9	62	28

INTAKE

The intake is designed to receive the Formation Fluid coming to the ESP.

The intake consists of a one-piece housing with holes For receiving Formation Fluid, with radial bearings pressed into the housing, inside which the shaft rotates. Outside, a suction strainer is installed on the intake to protect it From solids. The inner surface of the module is protected by Liner made of stainless steel.

With a low gas content at the intake (less than 25% of gas), the intake is installed between the pump lower section and protector.

With a high gas content, the intake is installed between the gas-handling system without intake holes and the protector.

EXAMPLE

INT-OS A406 HSS SS

INT-	OS	A	406	HSS	SS
1	1.1	2	3	4	5

1	Intake
1.1	Brand name - Oiltechsystems
2	Alnas design
3	Intake series
4	Shaft rating STD - standard strength shaft HSS - high strength shaft USS - Ultrahigh strength shaft
5	Corrosion resistance design: CS - carbon steel with carbon steel fasteners SS - stainless steel with monel fasteners

Description	Recommended Operating Range		Housing diameter		Shaft		Length		Weight	
	bpd @ 60 Hz	m3/d @ 50 Hz	in.	mm	in.	mm	ft	m	lb	kg
INT-OS A 272	0 – 1,163	0 – 185	2.72	69	0.551	14	0.9	0.265	13.5	6.1
INT-OS A 319	0 – 528	0 – 70	3.19	81	0.551	14	1.0	0.302	20.9	9.5
INT-OS A 338	0 – 755	0 – 100	3.78	96	0.669	17	1.0	0.302	23.2	10.5
INT-OS A 362	0 – 2,113	0 – 280	4.06	103	0.787	20	1.0	0.302	28.2	12.8
INT-OS A 406	0 – 6,038	0 – 800	4.25	108	0.984	25	1.0	0.302	31.1	14.1
INT-OS A 449	0 – 9,434	0 – 1,250	4.84	123	1.102	28	0.9	0.287	33.1	15.0

MOTOR PROTECTORS

Motor protectors are designed to protect the submersible motor from the ingress of formation fluid and to compensate for the thermal expansion of oil during operation in wells with a temperature of formation fluid up to 356°F (180°C).

FEATURES & BENEFITS

· Using mechanical shaft seals in motor protector with a wear-resistant friction pair with a working temperature of up to 428°F (220°C);

· Lower thrust bearing with self-alignment segmens is used in manufacturing of high-load motor protectors. The thrust bearing segments are coated with the PEEK polymer antifriction material;

· A cooler filter provides for oil filtration and cooling in the area of the protector thrust bearing assembly;

· Bypass check valves or a bag elastic strap ensure relief of excess internal pressure and gas removal from the motor oil cavity during the operation of the ESP;

· Protector shafts are made of high strength stainless steel.

Protector developed by Alnas has configurations with two- or three chambers. The tandem Motor protector consist of an upper and lower protectors of the tandem type.

Motor protector is a combination of labyrinth and bag chambers.

The labyrinth chamber consists of an oil-filled hollow chamber with two tubes directed up and down, which create a barrier for formation fluid entering the electric motor. The labyrinth section pushes oil into the annulus if the temperature of the motor increases.

The bag chamber consists of an oil-filled diaphragm. The diaphragm compensates for temperature changes in the volume of oil in the electric motor.

Protector is installed between the electric motor and the pump intake (intake module, slot filter or gas-handling system with intake holes).

EXAMPLE

MPR-OS A406 LSBPB HS HL/512 S HSS CR1 T1

MPR-	OS	A	406	LSBPB	HS	HL	/512	S	HSS	CR1	T1
1	1.1	2	3	4	5	6	7	8	9	10	11

1	Motor Protector
1.1	Brand name - Oiltechsystems
2	Alnas design
3	Protector series
4	Chambers configuration: L - labyrinth B - bag S - series connection P - parallel connection
5	Speed classification Blank - standard HS - high speed
6	Thrust bearing: Blank - standard HL - High load bi-directional thrust bearing
7	Protector Head/Base for particular intake/motor series connection /512 - Base for 512 series motor connection
8	Configuration: S - single CT - central tandem LT - lower tandem T - tandem (2 or 3 sectioned complete protector)
9	Shaft rating STD - Standard strength shaft HSS - High strength shaft USS - Ultrahigh strength shaft
10	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
11	Ambient temperature rating T - for 248°F (120°C) T1 - for 302°F (150°C) T2 - for 356°F (180°C)

MOTOR PROTECTORS

Pump			Motor			Recommended Motor Protector			
pump series	Max.load		motor series	Max.power		Description	Max. fluid temperature, °F [°C]	Oil volume	
	lbf @ 60 Hz	kgf @ 50 Hz		hp @ 60 Hz	kW @ 50 Hz			gal	l
272	1,720	650	319	101	63	MPR-OS A 272 LSBSB HS HL S	302 [150]	0.5	1.9
	1,720	650	319	201	125	MPR-OS A 272 LSBPB HS HL S	302 [150]	1	3.8
319	7,144	2,700	319	201	125	MPR-OS A 319 LSBSB HS HL S	302 [150]	0.45	1.7
338	1,852	700	378	113	70	MPR-OS A 338 LSBPB S	302 [150]	1.19	4.5
	7,065	2,670				MPR-OS A 338 LSBPB HL S		1.19	4.5
362, 406, 449	1,985	750	406, 461	201	125	MPR-OS A 362 LSB S	302 [150]	0.98	3.7
						MPR-OS A 362 LSBSB S		1.59	6
				290	180	MPR-OS A 362 LSBPB S		1.59	6
	2,117	800	461	258	160	MPR-OS A 406 LSB S	302 [150]	1.29	4.9
						MPR-OS A 406 LSBSB S		2.11	8
	9,261	3,500	406, 461	201	125	MPR-OS A 362 LSB HL S	302 [150]	0.98	3.7
						MPR-OS A 362 LSBSB HL S		1.59	6
				290	180	MPR-OS A 362 LSBPB HL S		1.59	6
			461	258	160	MPR-OS A 406 LSBSB HL S	302 [150]	2.11	8
406, 449	2,117	800	461	580	360	MPR-OS A 406 LSBPB S	302 [150]	2.11	8
	2,381	900	512	580	360	MPR-OS A 449 LSB S	302 [150]	1.48	5.6
						MPR-OS A 449 LSBSB S		2.38	9
	9,261	3,500	461	580	360	MPR-OS A 406 LSBPB HL S	302 [150]	2.11	8
	9,261	3,500	406, 461	201	125	MPR-OS A 362 LSBSB HL T	356 [180]	3.17	12
				290	180	MPR-OS A 362 LSBPB HL T		3.17	12
			461	403	250	MPR-OS A 406 LSBSB HL T	356 [180]	3.96	15
				580	360	MPR-OS A 406 LSBPB HL T		3.96	15
			512	403	250	MPR-OS A 406 LSBSB HL T /512	356 [180]	3.96	15
				580	360	MPR-OS A 406 LSBPB HL T /512		3.96	15
	21,591	8,160	512	580	360	MPR-OS A 449 LSBPB HL T	356 [180]	2.38	9
449, 626	2,381	900	512	886	550	MPR-OS A 449 LSBPB S	302 [150]	2.38	9
	5,292	2,000	709	1208	750	MPR-OS A 626 BSB S		5.28	20
						MPR-OS A 626 LSBSB S		6.61	25
	21,591	8,160	512	886	550	MPR-OS A 449 LSBPB HL S		2.38	9

* S – Single; T – Tandem (Protector + Protector)

TECHNICAL DATA

Protector series	Description	HP required				Housing diameter		Shaft		Length		Weight	
		No load		Max. load									
		Hp @ 60 Hz	kW @ 50 Hz	Hp @ 60 Hz	kW @ 50 Hz	in.	mm	in.	mm	ft	m	lb	kg
272	MPR-OS A272 LSBSB HS HLS	0.6	0.4	2.4	1.5	2.72	69	0.551	14	6.3	1.9	66	30
272	MPR-OS A272 LSBPB HS HLS	0.6	0.4	2.4	1.5	2.72	69	0.551	14	7.2	2.2	77	35
319	MPR-OS A319 LSBSB HS HLS	0.6	0.4	2.4	1.5	3.17	80.5	0.787	20	9	2.8	132	60
338	MPR-OS A338 LSBPB S	0.6	0.4	2.1	1.3	3.39	86	0.984	25	9	2.7	187	85
338	MPR-OS A338 LSBPB HLS	0.6	0.4	2.6	1.6	3.39	86	0.984	25	9	2.7	187	85
362	MPR-OS A362 LSBS	0.6	0.35	2.3	1.4s	3.62	92	0.984	25	7.1	2.2	143	65
362	MPR-OS A362 LSBSB S	0.7	0.45	2.3	1.4	3.62	92	0.984	25	10.2	3.1	198	90
362	MPR-OS A362 LSBPB S	0.7	0.45	2.3	1.4	3.62	92	0.984	25	10.2	3.1	198	90
406	MPR-OS A406 LSBS	1	0.6	2.6	1.6	4.06	103	1.102	28	7.2	2.2	185	84
406	MPR-OS A 406 LSBSB S	1	0.6	2.6	1.6	4.06	103	1.102	28	10.3	3.1	243	110
362	MPR-OS A362 LSB HLS	0.7	0.45	2.9	1.8	3.62	92	0.984	25	7.1	2.2	143	65
362	MPR-OS A362 LSBSB HLS	0.7	0.45	2.9	1.8	3.62	92	0.984	25	10.2	3.1	198	90
362	MPR-OS A362 LSBPB HLS	0.7	0.45	2.9	1.8	3.62	92	0.984	25	10.2	3.1	198	90
406	MPR-OS A406 LSBSB HLS	1	0.6	3.2	2	4.06	103	1.102	28	10.3	3.1	243	110
406	MPR-OS A406 LSBPB S	1	0.6	2.6	1.6	4.06	103	1.102	28	10.3	3.1	243	110
449	MPR-OS A449 LSBS	1.3	0.8	2.9	1.8	4.49	114	1.378	35	8.5	2.6	265	120
449	MPR-OS A 449 LSBSB S	1.3	0.8	2.9	1.8	4.49	114	1.378	35	11.7	3.6	353	160
406	MPR-OS A406 LSBPB HLS	1	0.6	3.2	2	4.06	103	1.102	28	10.3	3.1	243	110
362	MPR-OS A362 LSBSB HLT	0.7	0.45	2.9	1.8	3.62	92	0.984	25	20.3	6.2	243	110
362	MPR-OS A362 LSBPB HLT	0.7	0.45	2.9	1.8	3.62	92	0.984	25	20.3	6.2	243	110
406	MPR-OS A406 LSBSB HLT	1	0.6	3.2	2	4.06	103	0.984	25	20.5	6.3	485	220
406	MPR-OS A406 LSBPB HLT	1	0.6	3.2	2	4.06	103	0.984	25	20.5	6.3	485	220
406	MPR-OS A406 LSBSB HLT/512	1	0.6	3.2	2	4.06	103	0.984	25	20.5	6.3	485	220
406	MPR-OS A406 LSBPB HLT/512	1	0.6	3.2	2	4.06	103	0.984	25	20.5	6.3	485	220
449	MPR-OS A449 LSBPB HLT	1.3	0.8	3.9	2.4	4.49	114	1.378	35	11.7	3.6	353	160
449	MPR-OS A449 LSBPB S	1.3	0.8	2.9	1.8	4.49	114	1.378	35	11.7	3.6	353	160
626	MPR-OS A 626 BSBS	2.4	1.5	4	2.5	6.26	159	1.654	42	8.4	2.5	441	200
626	MPR-OS A626 LSBSB S	2.4	1.5	4	2.5	6.26	159	1.654	42	10.4	3.2	551	250
449	MPR-OS A449 LSBPB HLS	1.3	0.8	3.9	2.4	4.49	114	1.378	35	11.7	3.6	353	160

INDUCTION MOTORS

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

Alnas 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 & 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 Alnas 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.

INDUCTION MOTORS

EXAMPLE

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

IM-	OS	A	461-	200	HV	1620V	76A	UT	CR1	T1
1	1.1	2	3	4	5	6	7	8	9	10

1	IM – Induction motor
1.1	Brand name - Oiltechsystems
2	Alnas 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 (№ of sections)	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

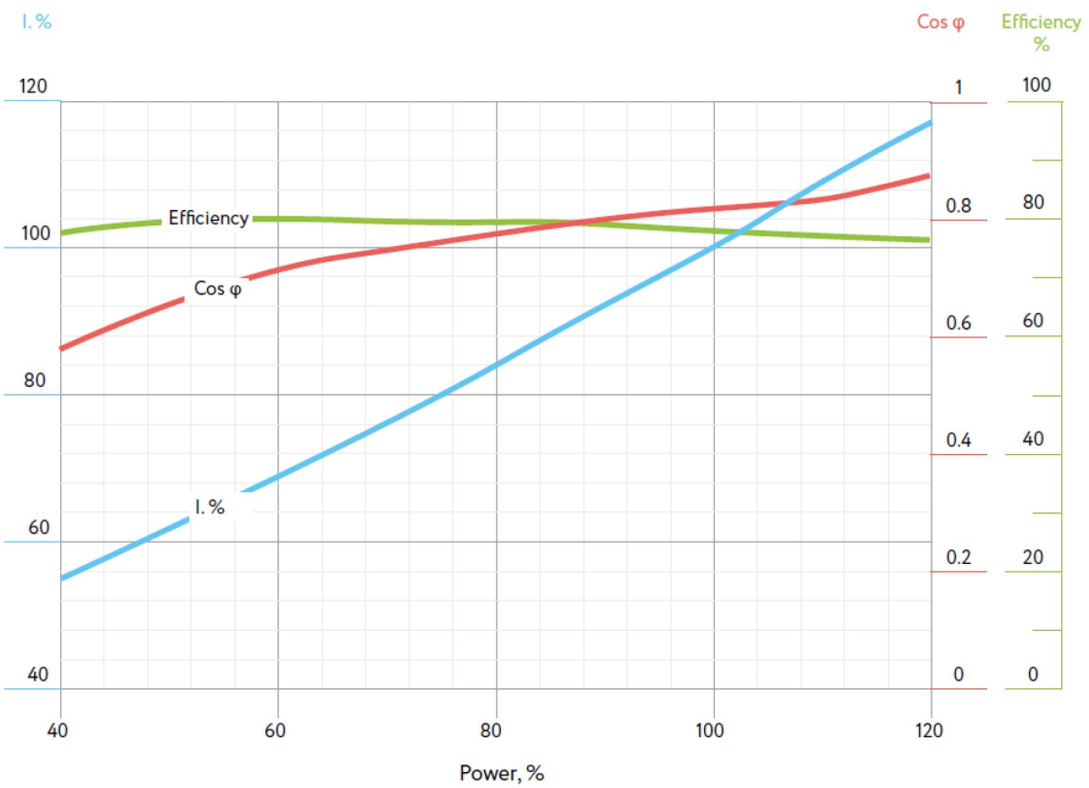
*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem

TECHNICAL DATA

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

378 SERIES STANDARD INDUCTION MOTORS

378 SERIES STANDARD MOTOR PERFORMANCE CURVE @60 HZ



406 SERIES STANDARD INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (№ of sections)	Length		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

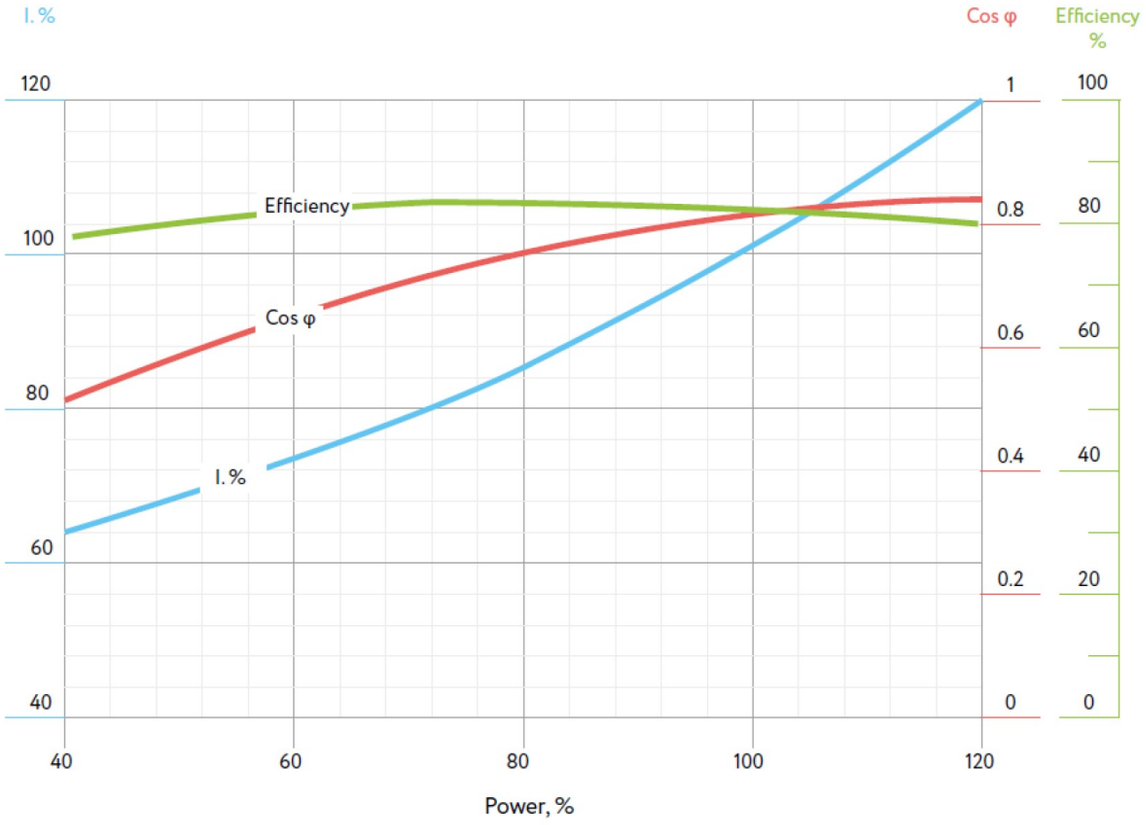
*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem

406 SERIES STANDARD INDUCTION MOTORS

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 STANDARD MOTOR PERFORMANCE CURVE @60 HZ



406 SERIES HIGH-VOLTAGE INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (№ of sections)	Length		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

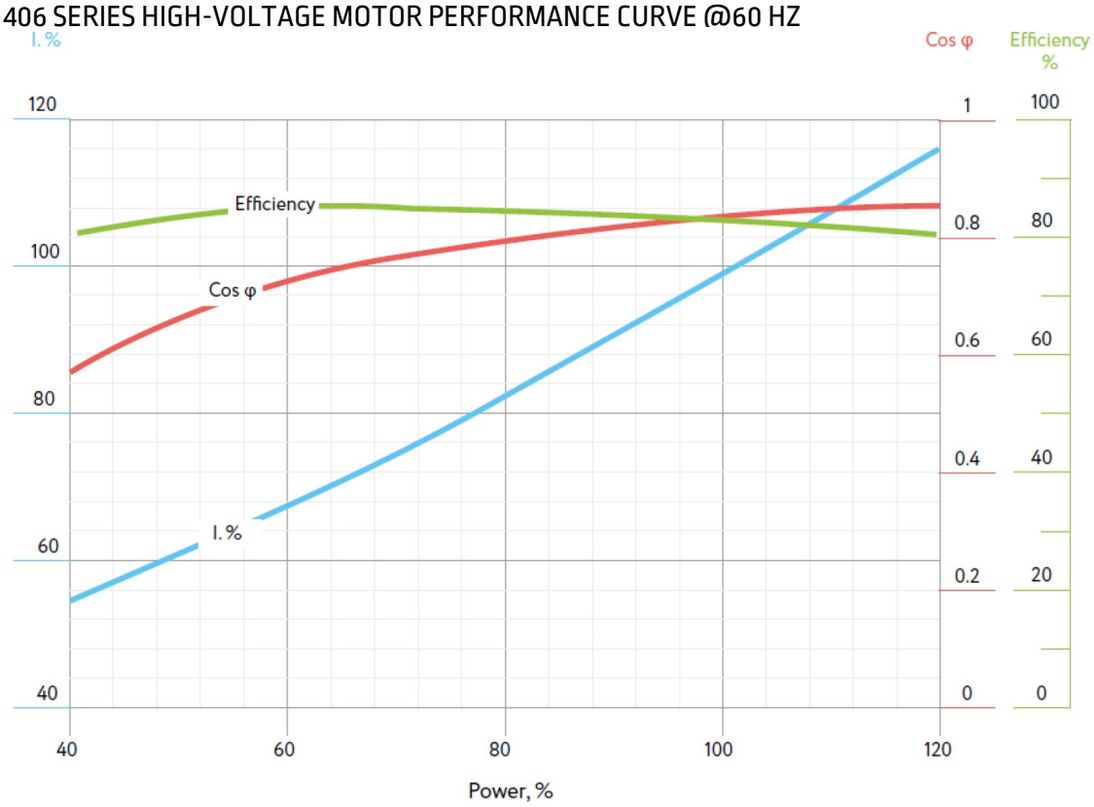
*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem

406 SERIES HIGH-VOLTAGE INDUCTION MOTORS

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 MOTOR PERFORMANCE CURVE @60 HZ



461 SERIES STANDARD INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (№ of sections)	Length		Weight	
Power	Voltage	Voltage	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
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

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

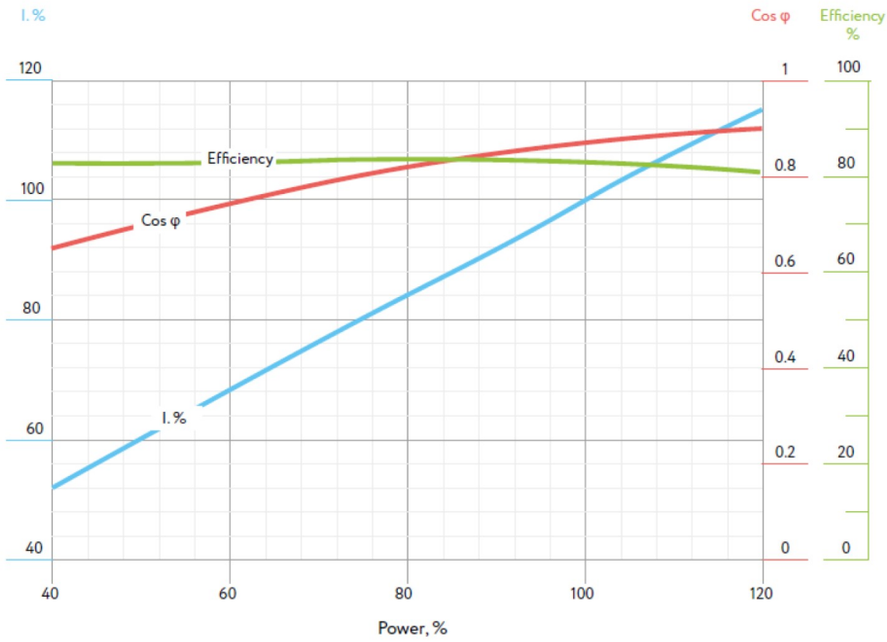
461 SERIES STANDARD INDUCTION MOTORS

60 Hz		50 Hz		Amperage	Type (№ of sections)	Length		Weight	
Power	Voltage	Voltage	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
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 STANDARD MOTOR PERFORMANCE CURVE @60 HZ



461 SERIES HIGH-VOLTAGE INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (№ of sections)	Length		Weight	
Power	Voltage	Voltage	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
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

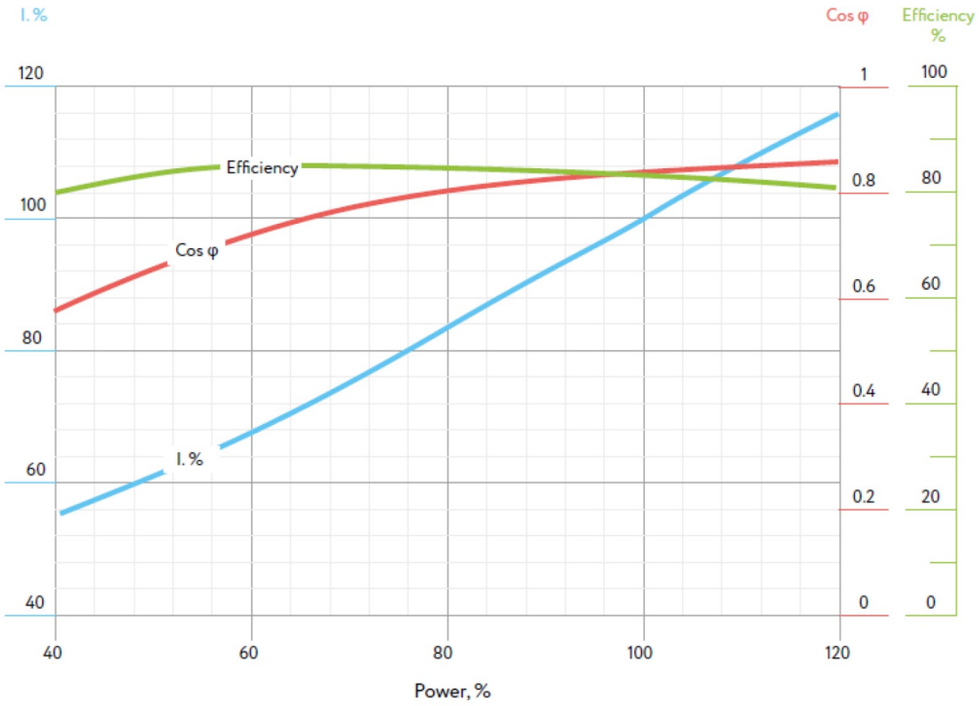
*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem

461 SERIES HIGH-VOLTAGE INDUCTION MOTORS

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 MOTOR PERFORMANCE CURVE @60 HZ



512 SERIES STANDARD INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (№ of sections)	Length		Weight	
Power	Voltage	Voltage	Voltage						
hp	V	kW	V	A		ft	m	lb	kg
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
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

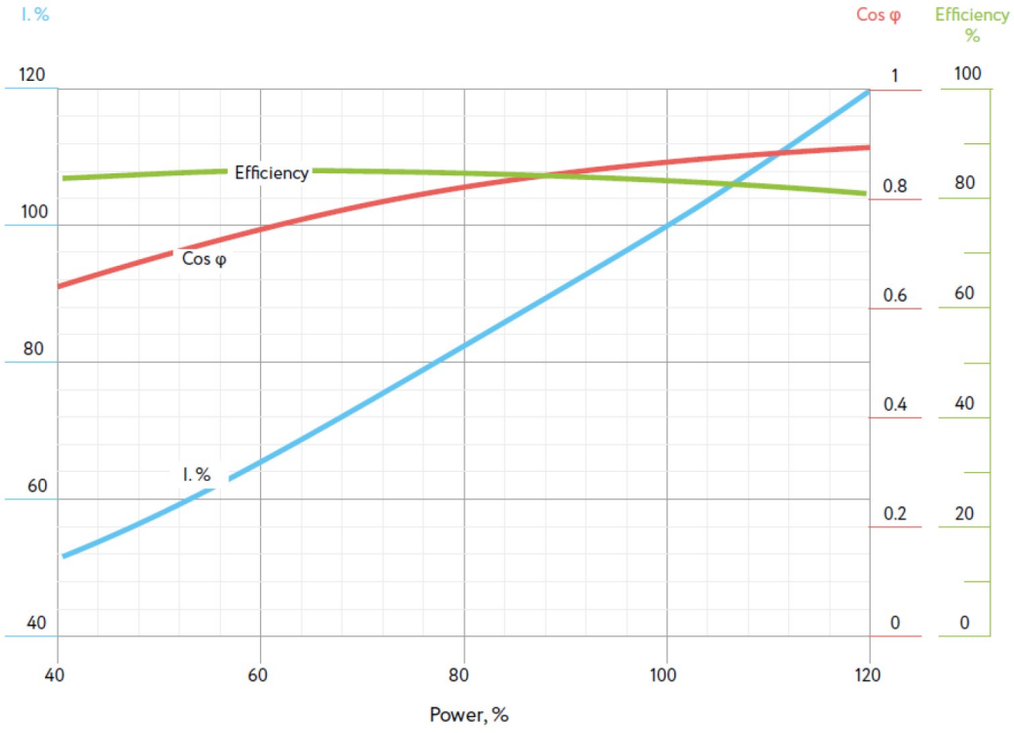
*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem

512 SERIES STANDARD INDUCTION MOTORS

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

512 SERIES STANDARD MOTOR PERFORMANCE CURVE @60 HZ



709 SERIES STANDARD INDUCTION MOTORS

CONTROL RANGE: 2,100-4,200 RPM

60 Hz		50 Hz		Amperage	Type (№ of sections)	Length		Weight	
Power	Voltage	Voltage	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	171	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

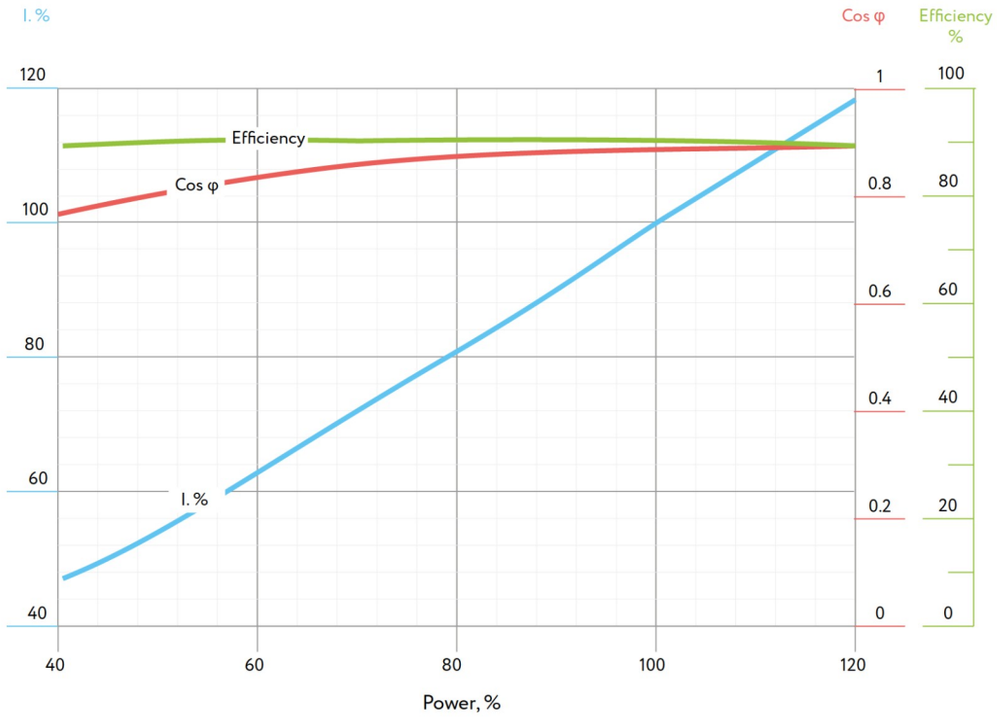
*S-Single, T-Tandem motor, UT-Upper Tandem, CT-Central Tandem, LT-Lower Tandem

709 SERIES STANDARD INDUCTION MOTORS

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	

709 SERIES STANDARD DUTY MOTOR PERFORMANCE CURVE @ 60 HZ



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. Alnas 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 & 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-OS A 319-80-6 2910V 18.5A S CR1 T1

PMM-	OS	A	461-	72.4	3600	1764V	21A	S	CR1	T1
1	1.1	2	3	4	5	6	7	8	9	10

1	PMM – Permanent magnet motor
1.1	Brand name - Oiltechsystems
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

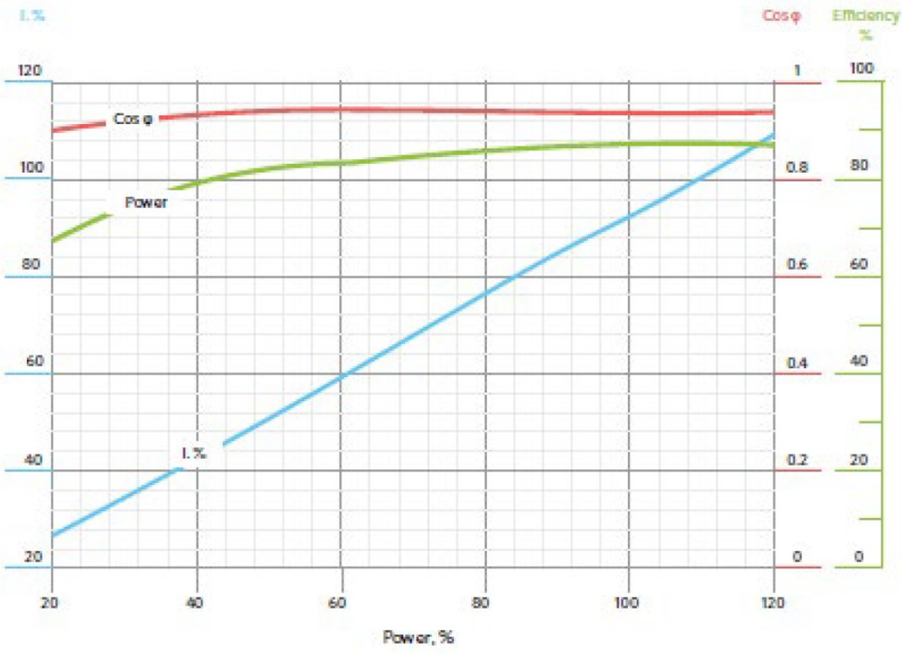
6,000 RPM			Amperage	Type (№ of sections)	Length		Weight	
Power		Voltage						
hp	kW	V	A		ft	m	lb	kg
43.5	32	1,200	23	S	12.4	3.8	366	166
54.4	40	1,350	23	S	13.6	4.1	401	182
67.0	50	1,700	23	S	17.7	5.4	467	212
85.6	63	2,200	23	S	25.6	7.8	569	258
122.4	90	2,950	21	S	27.5	8.4	736	334
170.0	125	2,550	34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

319 SERIES STANDARD DUTY PERMANENT MAGNET MOTOR PERFORMANCE CURVE @6,000 RPM



461 SERIES PERMANENT MAGNET MOTORS

CONTROL RANGE: 2,100-4,200 RPM

3,600 RPM		3,000 RPM		Amperage	Type (№ of sections)	Length		Weight	
Power	Voltage	Voltage	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

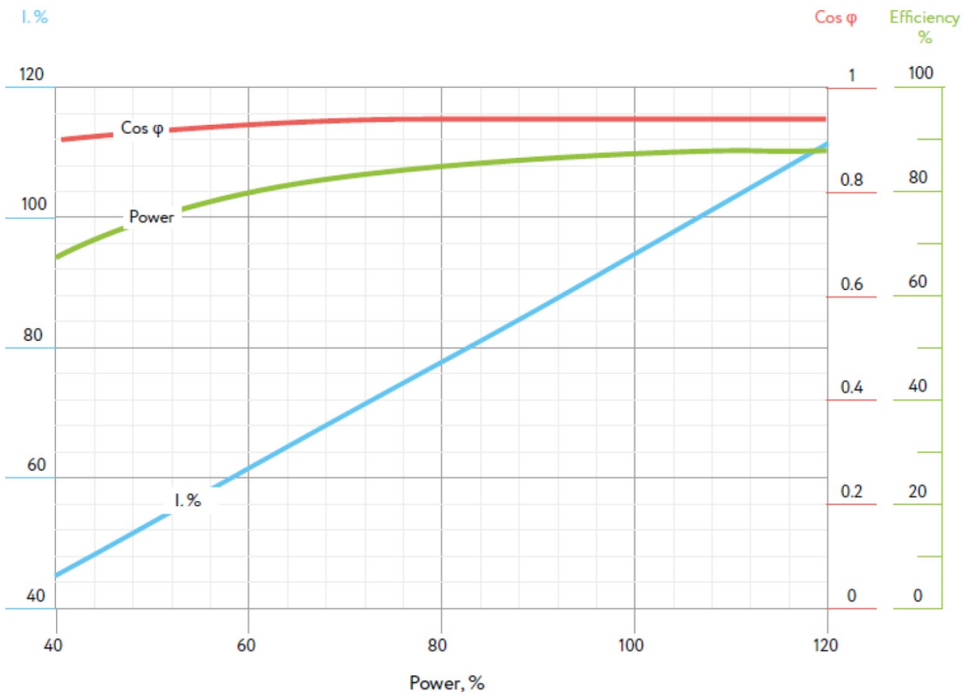
*S-Single

461 SERIES PERMANENT MAGNET MOTORS

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 STANDARD DUTY PERMANENT MAGNET MOTOR PERFORMANCE CURVE @ 3,600 RPM



BOLT-ON DISCHARGE HEAD

The BODH is attached to the head of the pump section and is designed to connect the ESP to the tubing.

EXAMPLE

BODH-OS A 362 2.875 8RD EUE SS

BODH-	OS	A	362	2.875	8RD EUE	SS
1	1.1	2	3	4	5	6

1	Bolt-on discharge head
1.1	Brand name - Oiltechsystems
2	Alnas design
3	For pump series
4	For tubing size
5	Thread type 10RD NUE – 10 threads per inch, non-upset end 8RD EUE – 8 threads per inch, external upset end
6	BODH metallurgy material CS – carbon steel SS – stainless steel

Pump Series	Thread	Housing diameter		Length		Weight	
		in.	mm	ft	m	lb	kg
BODH-OS A 272	1.875 10RD NUE	2.72	69	0.39	0.120	5.1	2.3
BODH-OS A319	BODH integrated in UT pump section						
BODH-OS A338	2.375 10RD NUE	3.39	86	0.77	0.235	14.3	6.5
BODH-OS A362	2.375 8RD EUE	3.62	92	0.48	0.146	9.7	4.4
	2.875 10RD NUE	3.62	92	0.48	0.146	8.8	4.0
	2.875 8RD EUE	3.62	92	0.48	0.146	8.2	3.7
BODH-OS A406	2.375 8RD EUE	3.62	92	0.48	0.146	9.7	4.4
	2.875 10RD NUE	3.62	92	0.48	0.146	8.8	4.0
	2.875 8RD EUE	3.62	92	0.48	0.146	8.2	3.7
	3.500 10RD NUE	4.29	109	0.48	0.146	9.9	4.5
	3.500 8RD EUE	4.29	109	0.48	0.146	9.9	4.5
BODH-OS A 449	3.50010RD NUE	4.49	114	0.85	0.258	29.1	13.2
	3.500 8RD EUE	4.49	114	0.85	0.258	29.1	13.2
BODH-OS A 535	3.500 10RD NUE	5.35	136	0.85	0.258	29.1	13.2
	3.500 8RD EUE	5.35	136	0.85	0.258	29.1	13.2
	4.500 10RD NUE	5.35	136	0.85	0.258	29.1	15.2
	4.500 8RD EUE	5.35	136	0.85	0.258	29.1	15.2

VALVES

EXAMPLE

CVB-OS A 3.500 8RD EUE SS

CVB-	OS	A	3.500	8RD EUE	SS
1	1.1	2	3	4	5

1	Valve type BV – bleeder valve CVB – check valve ball type CVP – check valve plate type CVBS – check valve ball type spring-loaded
1.1	Brand name - Oiltechsystems
2	Alnas design
3	Tubing and thread size
4	For tubing size
5	Thread type 10RD NUE – 10 threads per inch, non-upset end 8RD EUE – 8 threads per inch, external upset end
6	Valve metallurgy material CS – carbon steel SS – stainless steel

BLEEDER VALVE

The bleeder valve is designed to drain formation fluid from the tubing when lifting the ESP from the well. The valve is mounted above the sludge trap/check valve.

Pump Series	Recommended Operating Range		Housing diameter		Length		Weight	
	bpd @ 60 Hz	m3/d @ 50 Hz	in.	mm	ft	m	lb	kg
BV-OS A 1.875 10RD NUE	0 - 1,887	0 - 300	2.36	60	0.49	0.15	3.75	1.70
BV-OS A 2.375 10RD NUE	0 - 2,792	0 - 370	2.99	76	0.52	0.16	5.51	2.50
BV-OS A 2.875 10RD NUE	0 - 9,811	0 - 1,300	3.50	89	0.59	0.18	7.92	3.59
BV-OS A 2.875 8RD EUE	0 - 9,811	0 - 1,300	3.70	94	0.59	0.18	9.68	4.39
BV-OS A 3.500 10RD NUE	0 - 13,585	0 - 1,800	4.25	108	0.59	0.18	8.80	3.99
BV-OS A 3.500 8RD EUE	0 - 13,585	0 - 1,800	4.50	114.3	0.59	0.18	12.55	5.69

VALVES

CHECK VALVE

The check valve is designed to prevent back spin of the pump under the influence of a fluid column in the tubing (when the pump is shut down) and to make easier the subsequent start-up of the pump.
The valve is used for hydraulic testing of the tubing string integrity after the esp is run in hole.
The check valve also protects the ESP upper section from a small amount of solids precipitating in the tubing string when the pump is shut down. In case of a significant amount of solids, it is recommended to complete the pump unit with a sludge trap.
The valve is installed between the upper module section of the pump and the bleeder valve.

BALL TYPE, BALL TYPE SPRING LOADED

Pump Series	Recommended Operating Range		Housing diameter		Length		Weight	
	bpd @ 60 Hz	m3/d @ 50 Hz	in.	mm	ft	m	lb	kg
CVB-OS A 1.875 10RD NUE	0 – 1,887	0 – 300	2.68	68.00	0.49	0.15	5.51	2.50
CVB-OS A 2.375 10RD NUE	0 – 2,792	0 – 370	2.87	73.00	0.62	0.19	8.16	3.70
CVB-OS A 2.875 10RD NUE	0 – 9,811	0 – 1,300	3.50	89.00	0.66	0.20	11.91	5.40
CVB-OS A 2.875 8RD EUE	0 – 9,811	0 – 1,300	3.67	93.20	0.66	0.20	12.13	5.50
CVB-OS A 3.500 10RD NUE	0 – 9,811	0 – 1,300	4.25	108.00	0.66	0.20	17.64	8.00
CVB-OS A 3.500 10RD NUE	0 – 13,585	0 – 1,800	4.25	108.00	0.66	0.20	17.64	8.00
CVB-OS A 3.500 8RD EUE	0 – 13,585	0 – 1,800	4.50	114.30	0.66	0.20	17.86	8.10
CVBS-OS A 2.875 10RD NUE	0 – 9,811	0 – 1,300	3.50	89.00	0.72	0.22	14.33	6.50
CVBS-OS A 3.500 10RD NUE	0 – 9,811	0 – 1,300	4.25	108.00	0.75	0.23	19.85	9.00

PLATE TYPE

Pump Series	Recommended Operating Range		Housing diameter		Length		Weight	
	bpd @ 60 Hz	m3/d @ 50 Hz	in.	mm	ft	m	lb	kg
CVP-OS A 2.875 10RD NUE	0 – 6,038	0 – 800	3.50	89.00	1.09	0.33	10.80	4.90
CVP-OS A 2.875 8RD EUE	0 – 6,038	0 – 800	3.70	94.00	0.67	0.20	13.41	6.08

SHROUDS FOR A SUBMERSIBLE ELECTRIC MOTOR

Shroud is a cylinder fitted around the motor, protector and intake. It is designed to reduce the annular area between the ESP and the casing, which allows to increase the velocity of fluid by the motor.

APPLICATION

- Wells with a large inner diameter of the casing string;
- Wells operated below or in the casing perforation area;
- Wells with high temperature of formation fluid;
- Wells with low or unstable inflow.

The shroud consists of a hanger, pipe or pipes with threaded couplings installed between the pipes, and a tip. The shroud is equipped with a centralizer installed in the base of the electric motor during assembly to ensure uniform cooling of the motor during operation. At the bottom of the shroud, there is a tip with the 2 7/8" thread for attaching load (research instruments) weighing no more than 551 lbs (250 kg).

The shroud for Series 406 electric motor is mounted on a special ESP intake module using special threaded screws. The shroud for Series 461 or 512 electric motor is attached to the base of the gas separator without intake holes or to the base of the Series 362, 406 or 449 ESP lower section, using a special hanger.

The length of the shroud is selected depending on the total length of the ESP components: protector, motor, downhole gauge, and centralizer. The useful length of the shroud shall be greater than the total length of the ESP components inside the shroud.

The length of the shroud is determined by the amount of the installed lengths of all shroud components.

SHROUD

Pump Series	Motor series	Minimum casing ID		Recommended shroud				
				Shroud	Shroud OD		Shroud ID	
		in.	mm	kW	in.	mm	in.	mm
362	406	5.12	130	Shroud, A406 124	4.88	124	4.53	115
362, 406	461	5.83	148	Shroud, A461 140	5.51	140	4.96	126
406, 449	512	6.30	160	Shroud, A512 159	6.26	159	5.87	149

SHROUDS FOR A SUBMERSIBLE ELECTRIC MOTOR

FEATURES OF SHROUD COMPONENTS

Shroud type	Shroud component	Useful length *		Installed length		Weight	
		Ft	m	Ft	m	lb	kg
Shroud, A406 124	Special purpose intake module	-	-	0.92	0.279	29	13.2
	shroud pipe	9.84	3.0	9.84	3.0	88	40
		13.12	4.0	13.12	4.0	117	53
		16.41	5.0	16.41	5.0	148	67
		19.69	6.0	19.69	6.0	176	80
		22.97	7.0	22.97	7.0	205	93
	threaded sleeve	0.23	0.07	0.23	0.07	9	4.0
	tip	-	-	0.54	0.164	16	7.4
Shroud, A461 140	hanger: 362 series pump 406 series pump	-	-	0.36	0.110	21 20	9.3 9.2
	shroud pipe	13.12	4.0	13.12	4.0	185	83.8
		16.41	5.0	16.41	5.0	222	100.5
		19.69	6.0	19.69	6.0	259	117.5
		22.97	7.0	22.97	7.0	295	134.0
	threaded sleeve	0.23	0.07	0.23	0.07	3	1.3
	tip	-	-	0.44	0.135	20	9
Shroud, A512159	hanger: 406 series pump 449 series pump	-	-	0.38 0.38	0.115 0.115	31 24	13.9 11.1
	shroud pipe	13.12	4.0	13.12	4.0	166	75.2
		16.41	5.0	16.41	5.0	208	94.2
		19.69	6.0	19.69	6.0	250	113.2
		22.97	7.0	22.97	7.0	292	132.2
	threaded sleeve	0.26	0.08	0.26	0.08	12	5.5
	tip	-	-	0.58	0.177	24	10.9

SLUDGE TRAP

The sludge trap is designed to protect ESP From the solids in the tubing string when the pump is shut down. The sludge trap is installed above the check valve (under the bleeder valve).

EXAMPLE

ST-OS A 3.500 8RD EUE 6MSS

ST-	OS	A	3.500	8RD EUE	6M	SS
1	1.1	2	3	4	5	6

1	Sludge trap
1.1	Brand name - Oiltechsystems
2	Alnas design
3	For tubing size
4	Thread type 10RD NUE – 10 threads per inch, non-upset end 8RD EUE – 8 threads per inch, external upset end
5	Length, m (From 1 up to 13 m)
6	SC metallurgy material CS - carbon steel SS - stainless steel

SLUDGE TRAPS

Pump Series	Recommended Operating Range		Housing diameter		Length		Weight	
	bpd @ 60 Hz	m3/d @ 50 Hz	in.	mm	ft	m	lb	kg
ST-OS A 1.875 10RD NUE	0-1,887	0-300	2.4	60	19.8	6.035	41	18.5
ST-OS A 2.375 10RD NUE	0 - 2,792	0-370	3.0	76	5.1	1.549	15	6.75
ST-OS A 2.875 10RD NUE	0 - 6,038	0-800	3.5	89	16.5	5.042	49	22.19
ST-OS A 2.875 8RD EUE	0 - 6,038	0-800	3.6	92	2.7	0.831	13	6.0
ST-OS A3.500 10RD NUE	0-13,585	0-1,800	4.3	108	5.1	1.550	18	8.2
ST-OS A3.500 8RDEUE	0-13,585	0-1,800	4.5	114.3	5.1	1.540	18	8.2

The length of the ST is defined by request.

VARIABLE SPEED DRIVE (VSD)

The VSD-A manufactured by Izhneftemash is designed to control and protect a submersible induction or PM motor of an electric subnersible pump with a voltage of up to 5000 V.

BENEFITS

· Control

- a large graphic LCD and keyboard on the VSD controller can be used to receive information or configure the VSD.

· Servicing

- the modular design of the VSD makes it possible to service and repair the VSD at the place of operation.

· Downhole monitoring equipment and electricity metering - supports DME and electricity meters of various manufacturers.

· Easy-to-read data

- remote control and monitoring systems, including GPRS and Ethernet;
- manual reading of the VSD operation archive using a standard USB flash drive.

· Upgrading

- the possibility of upgrading and expanding the scope of functional parameters by reprogramming the VSD controller in the field.

The VSD-A is a three-way service metal cabinet with a power compartment, a control compartment in front. On the back of the cabinet, there are two cable gland compartments. The first cable gland compartment contains input terminals for connecting cables to the power supply. The second cable gland compartment contains output terminals for connecting the Transformer and a terminal for connecting a cable for measuring motor insulation resistance. On the side of the cabinet, there is a compartment for surface block and a compartment for an electric energy meter. On the cabinet roof, there are hinges for loading and unloading the VSD.

All VSD doors have special key locks and a tight seal. The elements energized when the cabinet door is open are covered with safety insulating shields. The VSD features an alarm activating when the power compartment door opens.

The VSD is manufactured with a built-in frequency converter and an output filter (at the request of the customer, the filter may be omitted):

· The frequency converter is designed to convert the input three-phase voltage to the output three-phase voltage with an adjustable frequency and the effective voltage value; the frequency converter is resistant to emergency and abnormal conditions;

· The VSD output filter is designed to prevent higher harmonic components in the frequency converter output voltage.

The VSD provides for archive generation, saving operation parameters and an log storage:

· Archive volume is at least 50,000 records;

· Event log volume is at least 2,000 events;

· Log is written on a USB flash drive.

The VSD provides for connection of external consumers using an alternating voltage of 220 V, a frequency of 50 Hz, and a rated current of up to 10A. The AC socket is designed to connect various geophysical and measuring equipment.

VARIABLE SPEED DRIVE (VSD)

VSD HAS THE FOLLOWING CONTROL FUNCTIONS:

· VSD control mode:
  - manual;
  - automatic;
  - programmable (Set up of operating time and idle time, work in a cyclic mode).
· Remote control of VSD operation parameters through modem;
· Ramping up the pump to a given Frequency according to a program;
· The built-in PID controller maintains the process parameters of the pump unit;
· Metering of consumed active and reactive electricity, with or without energy meters:
  - automatic optimization of the U/F characteristics when changing the Motor Load;
  - the PWM modulation change mode ensures reduced power losses in the frequency converter in the loaded state, while Lowering the Level of harmonics at the output of the control VSD.
· Direct or remote control of the submersible motor:
  - smooth acceleration and braking;
  - jogging start-up mode;
  - shaking mode start-up;
  - motor speed control;
  - changing the motor starting torque;
  - changing the direction of rotation;
  - delayed motor restart when protections are triggered;
  - start blocking after exceeding the number of restarts.
· Smart back spin lock and rotation revers mode;
· Smart pump unit wedging mode;
· Smart mode For pumping and removing gas lock;
· Shaking mode with a set shaking period and Frequency (prevention of scaling on the pump impellers);
· VSD output voltage automatic optimization mode;
· VSD output current limiting mode.

FEATURES

· ESP operation parameters measurement:
  - active power consumption: from 0 to 1,342 hp (0 to 1,000 kW);
  - load power factor (cos): from 0 to 1.0;
  - insulation resistance in the motor power supply circuit for high voltage: from 0 to 10 MΩ;
  - direction and frequency of Back spin: from 1 to 40 Hz.
· metering of consumed active and reactive energy: - measurement error without an electric energy meter is no more than 2.5%;
  - measurement error with an electric energy meter is no more than 0.5%.
· VSD with bypass contactors (option):
  - direct Motor start-up with the possibility of reverse motor operation;
  - transition from the frequency control mode to the Motor power supply from network.
· VSD with a contactor switching off output filter capacitors (option): - induction motor control;
  - PMM control.
· Built-in frequency converter and output filter;
· Displaying the values of all set points, current parameters and operating modes of the station, submersible equipment, wells;
· Automatic maintenance of esp operation process parameters;
· Flexible settings for each protection;
· Displaying symbolic and graphic information of the graphic in LCD;
· The vsd generates, saves and displays up to ten start-up graphs:
  - Three phases motor current;
  - Three phase motor voltage.
· Modern hardware components, a large set of software management and protection functions;
· USB software update;
· Replacement of the ksu-6 controller with the running or shut down motor;
· Two levels of protection against unauthorized access to changing the parameters and operating mode of the vsd;
· Forced air cooling or heating of power elements by a fan and heating coils integrated in the VSD.

THE VSD MONITORS THE WORK PARAMETERS OF THE FOLLOWING COMPONENTS:

· Powersupply:
  - input voltage;
  - input voltage imbalance;
  - phase sequence;
  - output voltage;
  - output voltage imbalance;
  - output Frequency.
· VSD control:
  - scanning of all VSD units during activation;
  - Full and active power output;
  - monitoring the VSD status.
· Downhole equipment:
  - transformer-cable-motor insulation resistance;
  - motor operation parameters:
    a. motor Load;
    b. power Factor (cos);
    c. voltage;
    d. motor current;
    e. current imbalance;
    f. motor oil pressure (if DME is available);
    g. motor winding temperature (if DME is available);
    h. vibration along three axes (if DME is available).
· Wells (if DME is available):
  - Formation Fluid temperature at intake;
  - Formation Fluid pressure at intake;
  - pressure in the pipeline header.

THE VSD GENERATES THE STATISTICS FOR OPERATION OF ELECTRIC MOTORS:

· Total operating time and downtime of the motor;
· Motor operating time since the last start-up;
· Motor downtime after the last shut down;
· Number of motor starts;
· Number of shut downs due to motor underload, overload;
· Number of motor shut downs due to other reasons.

VARIABLE SPEED DRIVE (VSD)

VSD SPECIFICATIONS

	VSD-A 250A	VSD-A400A	VSD-A630A	VSD-A800A
Current rating	250 A	400 A	630 A	800 A
Total power output at 50 Hz	150 kVA	240 kVA	380 kVA	480 kVA
Speed control range: -PMM - induction motor	1 - 200 Hz with 0.1 Hz increments 1 - 70 Hz with 0.1 Hz increments			
Supply voltage	~380Vat50 Hz			
Supply voltage Frequency	50 ±2 Hz			
Voltage deviation range, From rated value	-50...+25%			
Output voltage generation method	3 ... 6 kHz PWM, U/F characteristics.5 points			
Measuring input and output voltage in three phases	0-500V			
Current measurement in output power circuit	0-3,200 A		0 - 6,400 A	
Active power consumption measurement	0 -1,342 hp(0-1,000 l<W)			
Output Filter	built-in sinus filter			
VSD controller	KSU-6			
Efficiency of the VSD at nominal operation mode, not less thanwith an integrated output filter 95%	95%			
Overload current, From rated value (within 300 seconds)	125%			
Total harmonic distortion of output current and voltage, not more than with an integrated output filter	5%			
VSD degree of environmental protection	IP43			
Ambient temperature	-60...+50°C			
Air relative humidity	up to 100% at a temperature of +77°F (+25°C)			
Interfaces	RS-232 (2 pcs.). USB. RS-485 (2 pcs.). Ethernet. CAN (system)			
Protocols	GPRS. GPRS. ModbusRTU (Region 2000, Region 3.0, Telescope memory cards)			
Overall dimensions: [height x width x depth]	6.349 x 3.314 x 3.560 feet (1,935 x 1,010 x 1,085 mm)		6.283 x 3.215 x 3.609 feet (1,915 x 980 x 1,100 mm)	
Weight	970 Lbs (440 kg)	1,125 Lbs (510 kg)	1,499 Lbs (680 kg)	1,610 Lbs (730 kg)

SWITCHBOARDS AND VARIABLE SPEED DRIVES (VSD)

Oiltechsystems offers direct, soft start-up control stations, as well as frequency control stations intended for controlling the operation of submersible electric motors (induction, AC types) of the entire power Line, as well as for protecting and controlling ESP parameters. The control stations provide power to the Transformer - Submersible cable - ESM circuit, provide the process mode of operation and trouble-free usage of equipment. Control station trim is determined individually according to customer requirements.

SWITCHBOARDS

Parameter	Value
Type of connected motor	Asynchronous
Supply voltage, V	380,480,660 - 4000,1000 - 5000
Frequency, Hz	50...60
Rated current, A	100-3200
Enclosure	NEMA3-NEMA4X
Range of voltage deviation from rated value	From -30% to 25%
Additional modules	Telemetry of main manufacturers, energy meter SET-4TM, Mercury GPRS modem
Interfaces, protocols	RS-232 (2 pcs.), RS-485 (2 pcs.), USB, CAN(system), GPRS, ModbusRTU, Region 2000,Telescope
Downhole sensors	Izhevsk, Triol, Elekton, Phoenix, WoodGroup, Borets, Novomet, SCAD-2002
SCADA communication	Yes
Temperature range, C	from -60 to +50

VARIABLE SPEED DRIVES

Parameter	Value
Type of connected motor	Asynchronous, synchronous, PMM
Supply voltage, V	380,480
Frequency, Hz	50...60
Rated current, A	100-1800
Enclosure	NEMA3-NEMA4X
Range of voltage deviation from rated value	From 30% to 25%
Rectification type	6-pulse, 12-pulse, 18-pulse
Output voltage generation method	Pulse-width modulation, 2.4-10 kHz, U/F characteristics, 5 points
Additional modules	Telemetry of main manufacturers, counter SET-4TM, Mercury GPRS modem
Interfaces, protocols	RS-232 (2 pcs.), RS-485 (2 pcs.), USB, CAN(system), GPRS, ModbusRTU, Region 2000,Telescope
Sine wave output filter	Integrated
Downhole sensors	Izhevsk, Triol, Elekton, Phoenix, WoodGroup, Borets, Novomet, SCAD-2002
Option «bypass on network»	Yes
SCADA communication	Yes
Temperature range, C	from -60 to +50

TRANSFORMERS / STEP-UP TRANSFORMERS

Step-up transformer (SUT) converts VSD/FSD Low voltage to high voltage required for submersible ESP motor. SUT has a wide range of output voltages to meet nominal voltage of motor with maximum accuracy so the motor can operate with maximum efficiency. In hermetically sealed designs the cooling fin design also enables a degree of flexibility which is needed to accommodate the expansion and contraction of the Liquid as it heats and cools, due to load and ambient temperature. This allows the tank to be totally filled (and hermetically sealed) with the clear benefit of prolonging the transformer's service life expectancy and reducing maintenance.

Hermetically sealed transformers offer indisputable advantages in comparison with transformers fitted with a conservator, including:

· The insulating liquid cannot come into contact with the air, thus guaranteeing preservation of its dielectric integrity;
· Reduced maintenance, eg. no checking required of the air dryer, no need to monitor the liquid for water ingress, etc;
· They occupy a smaller space, leaving more room for connections in compact installations.

Parameter	Value
Rated power, kVA	63-1200
Rated voltage, V	380/480 (50/60 Hz) - up to 5 kV
Connection type	Delta, star
Temperature range, C	From -60 to +50
Type	Oil Filled, sealed
Voltage taps	From 25 to 49

STEP-DOWN TRANSFORMERS

Step-down transformer (SDT) converts high supply voltage to voltage required for VSD/VFD. SDT can always be used as a step-up transformer.
The general secondary voltage is 0.4 kV.

Parameter	Value
Rated power, kVA	100-2500
Rated voltage, V	Up to 35000 - 380/480 V (50/60 Hz)
Second winding	Suitable For 12 pulse VSD
Connection type	Delta, star
Temperature range, C	From -60 to +50
Type	Oil Filled, sealed

PHASE-SHIFTING TRANSFORMERS

Phase-shifting transformers are the key components in our continuous ambition to improve energy efficiency of electrical systems. In control systems with variable frequency drives, alternating voltage Is rectified initially, then an inverter unit transforms it into alternate voltage with controlled frequency and amplitude. When voltage is rectified, undesirable higher current harmonics come to the network at the transducer side. A phase-shifting transformer installed in the circuit between an energy source and the control system is one of the effective ways to compensate higher current harmonics. Higher current harmonics circulate in circuits in the transformer and do not enter the network. The company offers a phase-shifting transformer with specifications below upon a customer's request.

Parameter	Value
Rated power, kVA	130-1000
Connection type	Delta, star
Temperature range, C	From -60 to +50
Type	Oil Filled, sealed

ALL TRANSFORMERS

Parameter	Value
Additional equipment	Temperature indicator
	Pressure relief valve
	Level gauge
	Pressure vacuum gauge

POWER CABLE AND MOTOR LEAD EXTENTION

The cable line is designed to supply voltage to the ESP submersible motor. Power cable and MLE share materials with highly reliable insulation and armor. They can be supplied in various versions, sizes and made from various materials, from insulation to armor.

Oiltechsystems manufactures cable products from cables made by leading Russian and foreign manufacturers. The basic configuration of the main components covers a very wide range of applications and can be used in various downhole conditions.

Parameter	Value
Conductor size, #AWG	1,2, 3, 4, 5, 6
Profile	Flat, round
Voltage, kV	3, 4, 5
Temperature rating, °C (°F)	Up to 232 (450)
Insulation	EPDM (ethylene propylene diene methylene) Polypropylene copolymer Polyethylene PEEK
Barrier	Lead Polyimide braid
Jacket	EPDM Oil-resistant nitrile rubber compound Polypropylene copolymer
Armor	Galvanized Stainless steel Monel

The design of the submersible cable and MLE vary significantly depending on the downhole conditions. For harsh down- hole conditions, cable lines with individually selected components are provided.

WELLHEAD PENETRATORS

Oiltechsystems can always supply ESP related wellhead feedthrough systems to the Oil and Gas industry including electrical feed- thru connectors, wellhead penetrators and feedthru systems, wellhead surface connectors. Oiltechsystems provides a wide range of products manufactured by different industry recognized companies.

MAIN FUNCTIONS OF FEEDTHRU SYSTEMS:

· Safety barrier for operation in explosive environment;
· Durable connection between surface and downhole cables;
· Sealing of surface cable in a wellhead;
· Withstand a broad spectrum of downhole conditions including high temperature, H_2S and CO_2;
· Isolation of liquid and gas at wellhead.

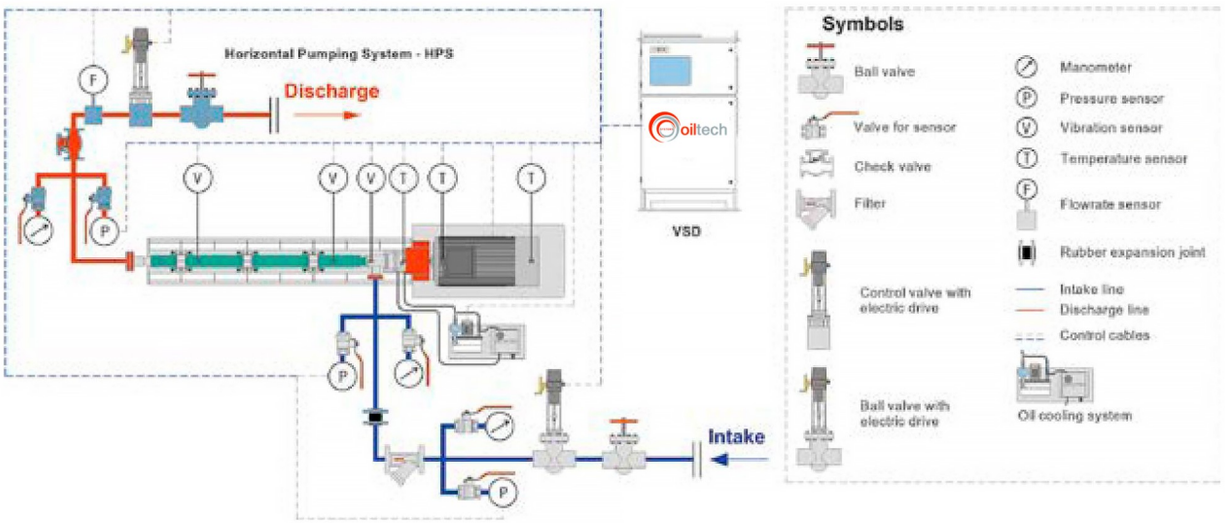
Parameter	Value
Type	Vertical, Side-entry, split-phase
Voltage rating	Up to 8 kVAC
Current rating	Up to 250 A
Rated temperature	Up to 260°C (500°F)
Working pressure	Up to 5000 psi
Assembly type	Factory, wellsite
Cable profile	Flat, round

HORIZONTAL PUMPING SYSTEM

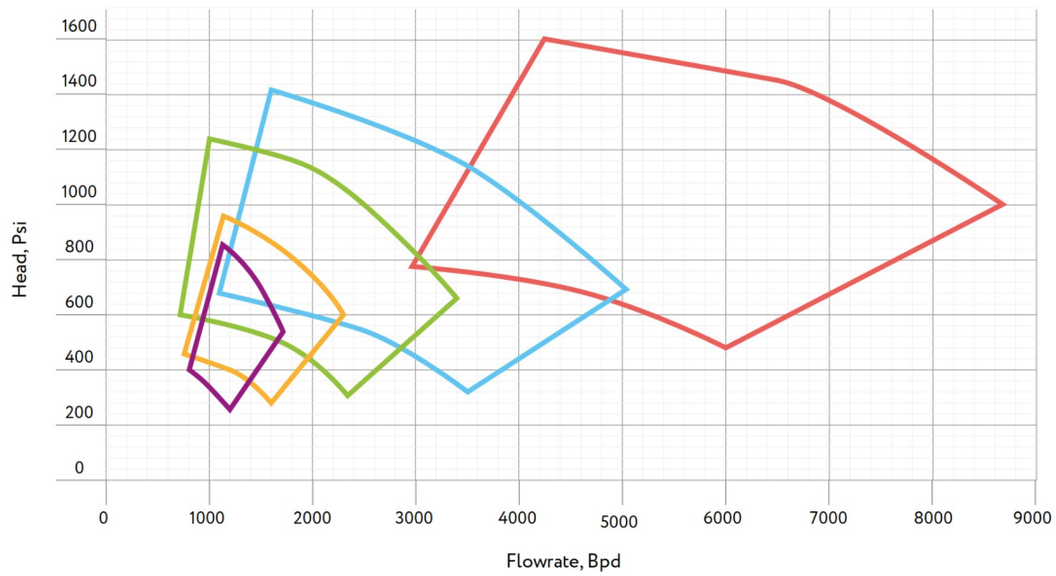
Horizontal Pumping System are commonly used to pump surface fluids through a pipeline. They can be used as single or in tandem to increase pressure and flow of fluid from one location to another.

BENEFITS

- Low suction pressure – work with pressure 2 psi at intake
- High temperature – work with temperature of fluid up to 300 °F (150 °C)
- Automation – fully automated and remote system control (pump frequency, control operation flowrate, etc.)
- Modular design – quickly replace components while upgrade or conducting corrective maintenance
- Flexibility – easily upgrade the system without changing the design
- Durability – reduce vibration and wear with high skid rigidity



OPERATION RANGES



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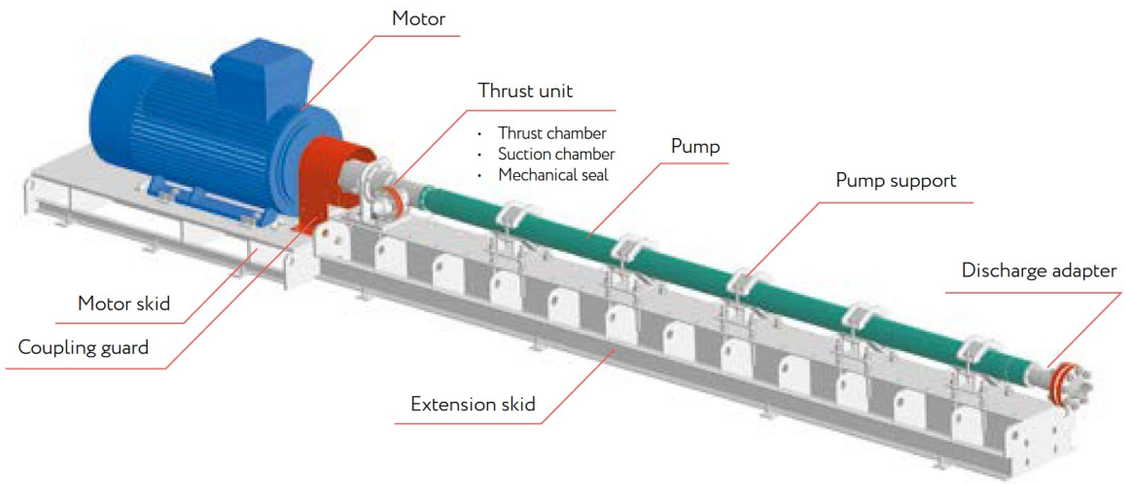
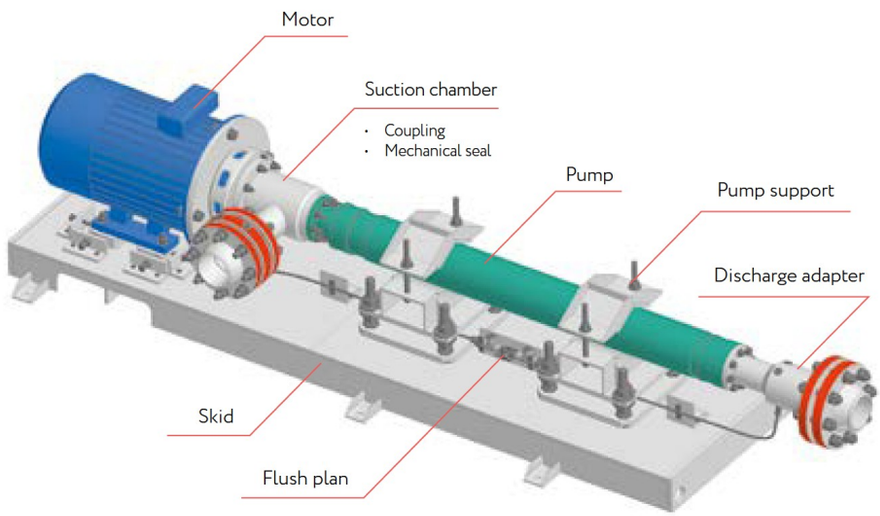
TRANSFERRING SYSTEM



BOOSTING SYSTEM



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