SHAKTI®

PUMPING LIFE

SOLAR PUMPS

DC SURFACE

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Considering continuous product development the information/performance/specifications and illustrations disseminated in this catalogue are subject to change without notice.

1. INTRODUCTION

Shakti solar powered pump is a powered by solar energy. A solar powered irrigation pump consists one or more solar panels (also known as solar modules or solar plates.) a pump (mostly a centrifugal pump), electronic controls or a controller device to operate the pump, the required hardware and in some cases other items like inverter, batteries etc. On a simpler note, solar powered pumps are like traditional electric pump with the only exception that it uses solar energy instead of fossil fuel or electricity. A solar powered pump can be cost-effective, environment-friendly and low-maintenance solution for meeting water requirements for irrigation, community water supply, livestock and other purposes.

A solar powered pump works like any other available and commonly used water pumps. The main difference is solar powered pumps run on solar energy and does not require any fuel (diesel, kerosene, gas, etc.) or external source of electricity (from an electricity company) to deliver water.

Solar Pump Monoblock System

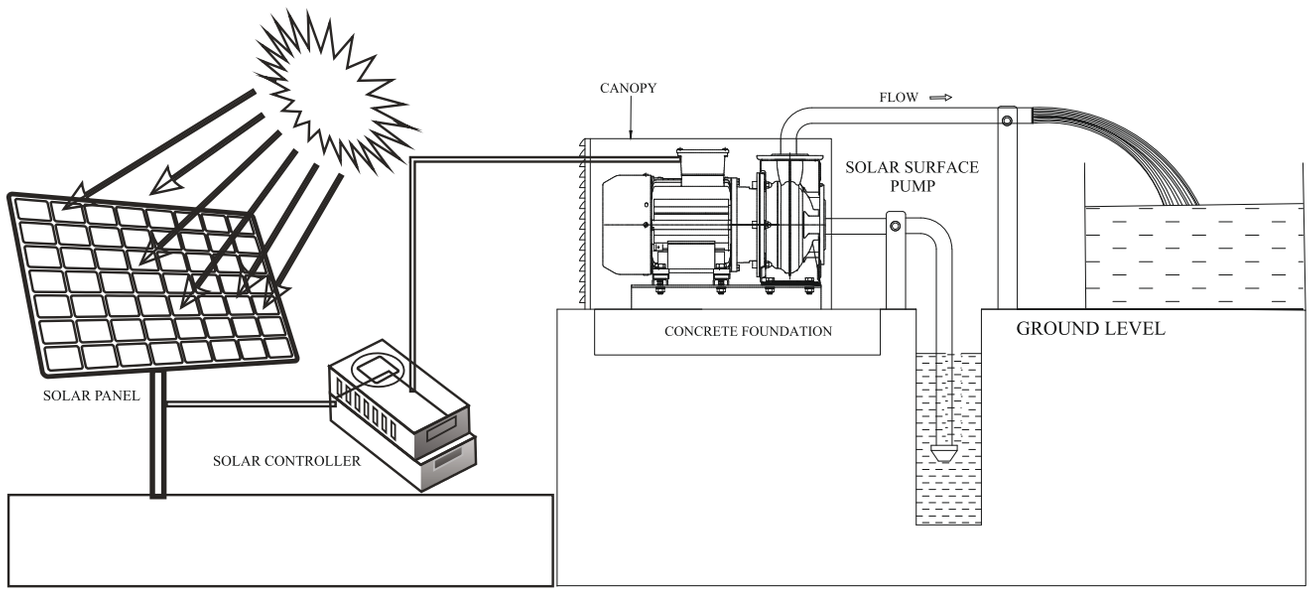


Fig. 1 Schematic illustration of Solar Powered Pumping System

Sunrays fall on the solar photovoltaic (PV) modules (a combination of multiple photovoltaic cells) and produce direct current (DC). If the pump requires alternating current (AC), the DC current produced by solar PV panels is converted to AC through an inverter before being fed to the motor of the pump.

Shakti Solar Surface Pump set consists of following parts:

1. **Solar Structure :** The solar structure is a set of solar modules which are to be connected in series and possibly strings of modules connected in parallel to get the required power to operate the pump.

2. **Controller :** The controller is an electric device that matches the power output from the solar Structure to the pump motor and regulates the Operation of the pump according to the input energy from solar array.

3. **Solar Surface Pump :** The solar surface pump comprises of the motor which drive the movement (Prime mover) of pump impeller which moves the water under pressure.

Shakti Solar Surface Pumps

A surface pump installed in the open by the side of a water sources, for example an open well, lake or canal. The pump remains out of the water, and generally the motor and the pumps can be seen separately. Surface pumps are usually easy to install and maintain. Surface pumps can also be feasible options in cases where the water table is within a depth of up to 7 meters and an open water source is available.

SELECTION & SIZING

Minimum inlet pressure - NPSH

Calculation of the inlet pressure “H” is recommended when...

- The liquid temperature is high
- Water is drawn from depths
- The inlet conditions are poor
- The flow is significantly higher than the rated flow
- Water is drawn through long pipes

Calculation of maximum suction lift for water in open systems

To avoid cavitation, make sure that there is a minimum pressure on the suction side of the pump. The maximum suction lift "H" in metres head can be calculated as follows:

$H = pb \times 10.2 - NPSH - H_f - H_v - H_s$

pb = Barometric pressure in bar. (Barometric pressure can be set to 1 bar). In closed systems, p_b indicates the system pressure in bar.
NPSH = Net Positive Suction Head in metres head. (To be read from the NPSH curve at the highest flow the pump will be delivering).
H_f = Friction loss in suction pipe in metres head. (At the highest flow the pump will be delivering.)
H_v = Vapour pressure in metres head. (To be read from the vapour pressure scale."H_v" depends on the liquid temperature "T_m").
H_s = Safety margin = minimum 0.5 metres head.

If the "H" calculated is positive, the pump can operate at a suction lift of maximum "H" metres head.

If the "H" calculated is negative, an inlet pressure of minimum "H" metres head is required.

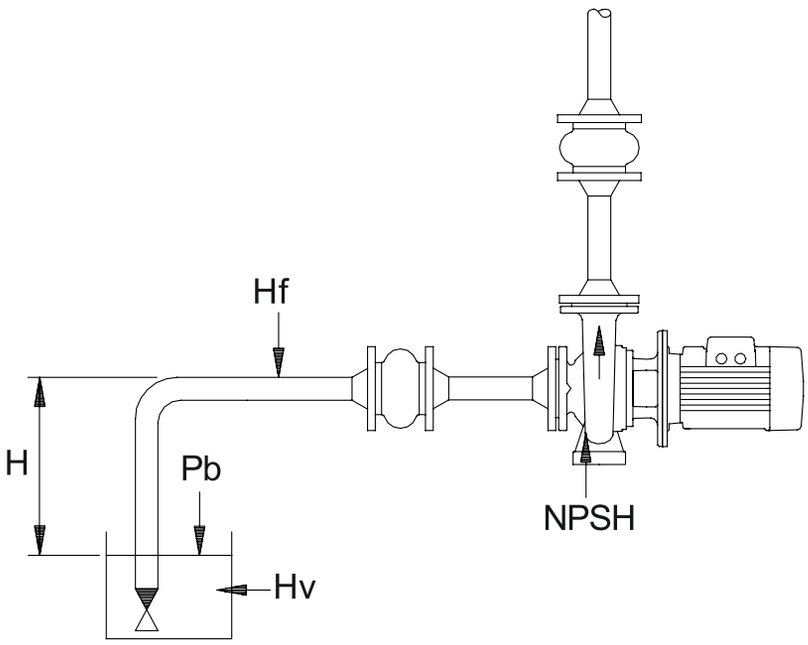


Fig.- 10 Schematic view of open system with Solar Surface Pump

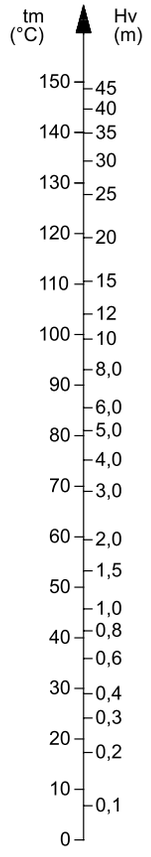


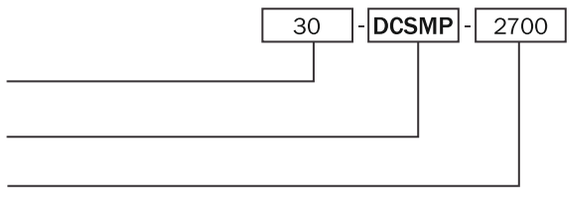
Fig.- 11 Relation between liquid temperature and vapour pressure

Note: In order to avoid cavitation never, select a pump whose duty points lies too far to the right on the NPSH curves. Always check the NPSH value of the pump at the highest. possible flow.

IDENTIFICATION

DCSMP SERIES

Type designation



* Note: 1. Input Power at Motor End.
2. Do not operate pump above its recommended duty head,

The high Efficient Motor is designed according to the permanent magnet principle with separate electronics unit. The Motor speed range is 1000-3600 RPM depending on pump load. The permanent magnet motor featuring a consistent higher efficiency within power range compared to a conventional asynchronous motor.

SOLAR PUMP CONTROLLER SPECIFICATION

OVERVIEW

The controller starts the pumps slowly and adjust it speed according to pumping load and power available from solar array.

Power output from the solar array is optimally matched to the load by maximum power point tracker(MPPT) throughout all conditions.

The Shakti Solar controller is designed with the high standard of reliability expected of Shakti products. The controller attempts to controller the pump and motor to deliver water even under adverse conditions, reducing output as necessary to protect the system components from damage, and only shutting down in extreme cases.

Controller Code	Description	VFD Voltage Range		VFD Max. Current (Amp.)	Efficiency %
		Min. (V)	Max (V)		
9000029204	SOLAR CONTROLLER 3P, 300/500 Watt	25	100	10	95
9000024063	SOLAR CONT.DC 300-500watts	35	125	10	97
9600000065	SHAKTI SUD1P,12A,300VDC/245VAC,.75/1HP	30	300	12	92
9600000001	SHAKTI SUD 1P,12A, 180 VDC,1HP	70	180	12	92
9600000002	SHAKTI SUD 1P,12A, 360 VDC,2HP	90	360	12	93
9600000004	SIMHA UNIVERSAL DRIVE 3Ø 14A	200	720	12	97
9600000094	SIMHA UNIVERSAL DRIVE 3Ø 20A	200	720	20	96

DESCRIPTIONS AND FEATURES

The Shakti Solar controller controller continuously monitors system performance and incorporates a number of features for pump system protection. In the event of a fault, the Shakti Solar drives will indicate the type of fault through the displays.

The Shakti Solar drives system is optimized for pumping under adverse input power conditions unique to solar arrays.

- Internal diagnostics will tolerate a lower input voltage.
- Whenever possible, the controller attempts to regulate the pump load in a manner that optimizes for maximum power transfer from the solar array.

An easy to use interface is provided to enhance configurability and enable remote system monitoring.

- A three-digit seven-segment display provides a detailed indication of system status.
- A small keypad offers flexibility for selection of user options.
- A continuous data connection for remote telemetry is made available via an RS-485 port. (Optional)

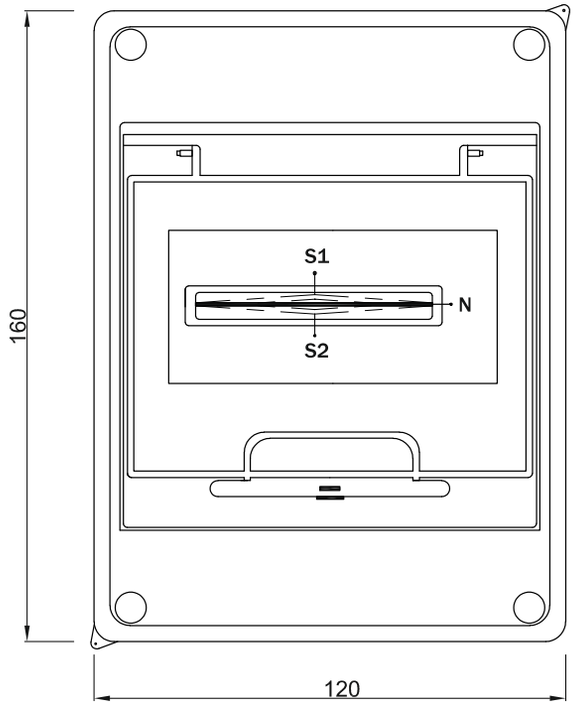
PROTECTION FEATURES

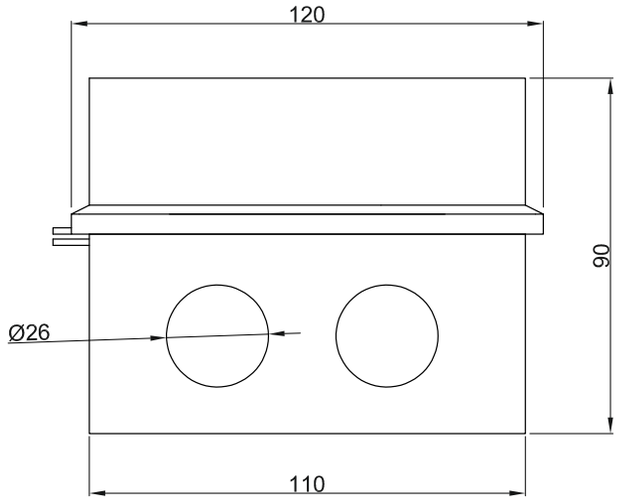
- Dry run Protection
- Overload Protection
- Open Circuit Protection
- Short Circuit Protection
- Over Heat

CHANGE OVER SWITCH

A change-over switch is a dual input single output device, which is used to change the input power source to the controller. It is generally used with controllers/drives which have options to run from solar as well as from grid. There are three operative positions in change-over switch corresponding to S1, S2, (Up and Down) & N (Middle). In case of S1 and S2 positions the corresponding sources are connected to output whereas and in N position none of the sources are connected to output. Conventionally the name of the sources is marked in S1 and S2 position for convenience of the user. These change-over switches are provided in a dust and rainproof boxes.

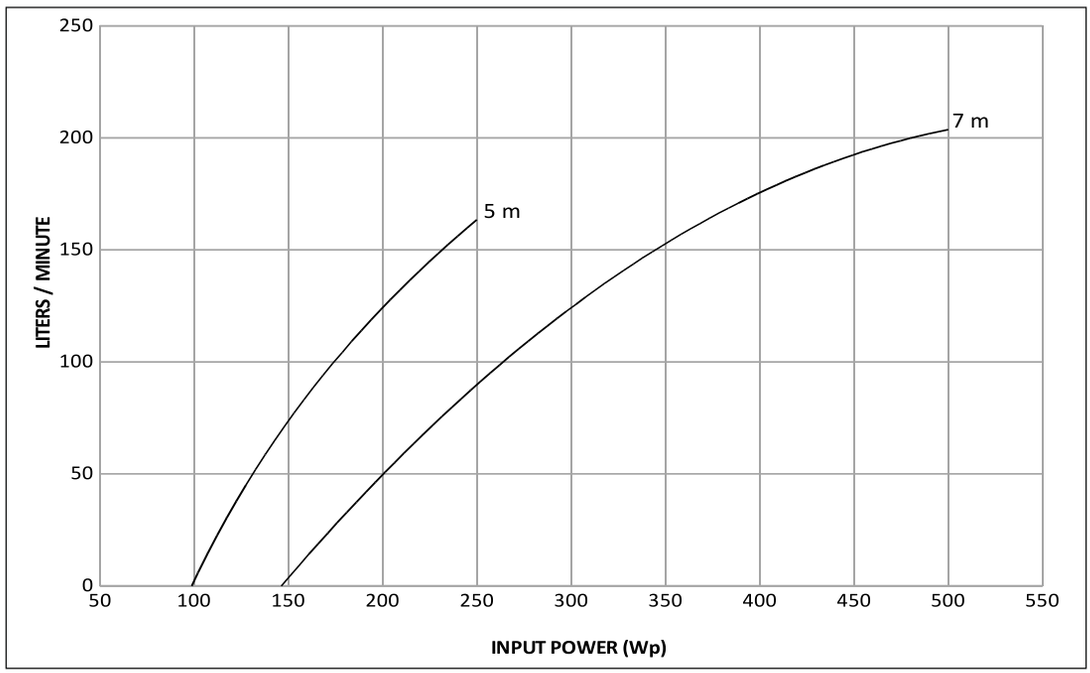
Note: It should be noted that while changing the power source through changeover the N position should be used until the display of the controller turns off. This intermediate use of N position avoids inrush currents through the changeover switch & improves its life.





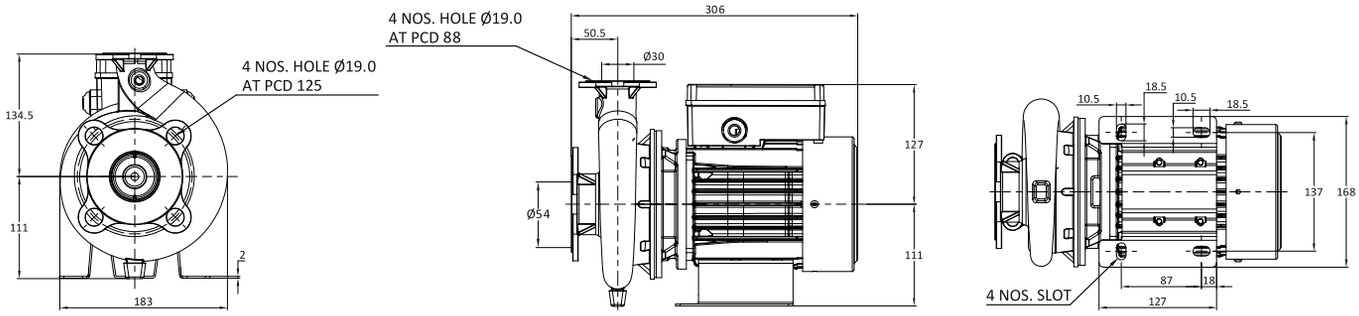
SOLAR 10 DCSSUP 300/500

PUMPSET CODE : 9500001534
DISCHARGE (LPD) : 67200/72750
DISCHARGE (LPW) : 224/145.5
DUTY HEAD : 5/7 METER



A	INPUT POWER (Wp)						
	500	450	400	350	300	200	150
HEAD (m)	FLOW IN LPM						
7	205	192	175	150	125	55	0
B	INPUT POWER (Wp)						
	250	200	175	150	125	100	
HEAD (m)	FLOW IN LPM						
5	155	128	108	80	35	0	

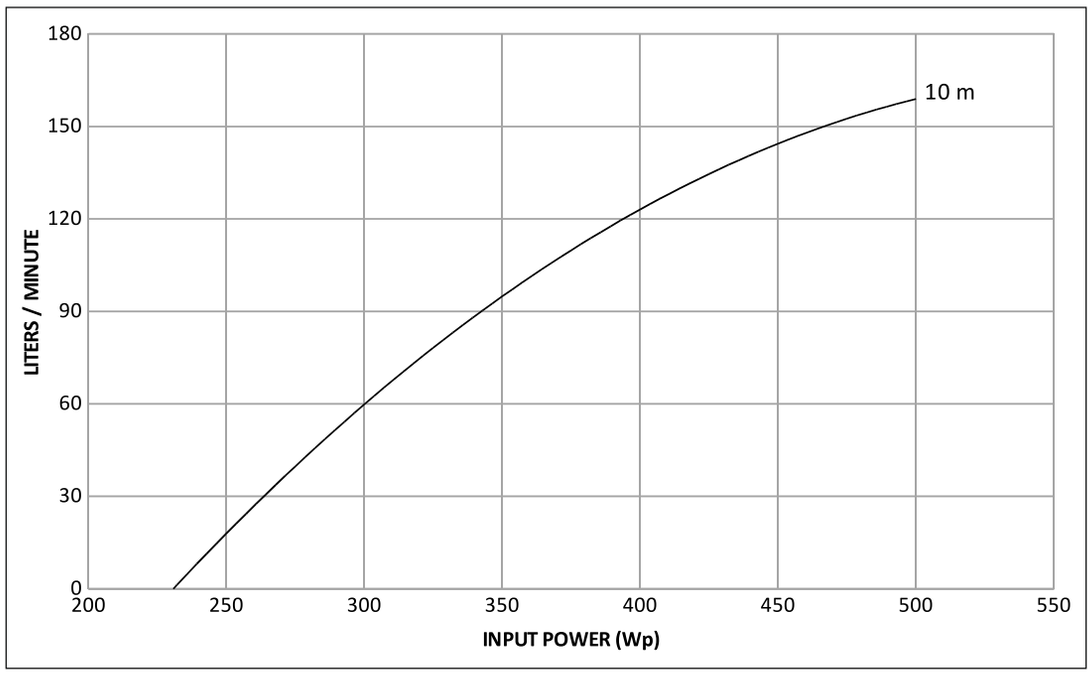
DIMENSIONAL -



Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
50 mm	50 mm

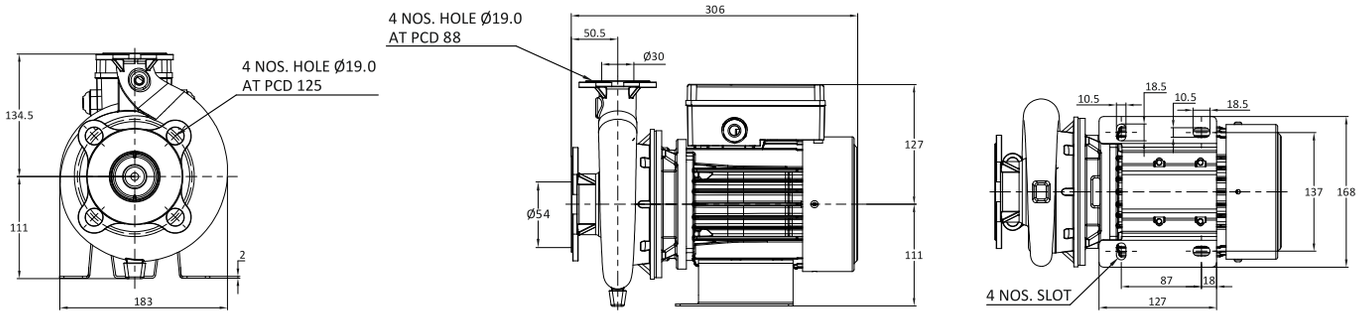
SOLAR 8 DCSSUP 500

PUMPSET CODE : 9500000973
DISCHARGE (LPD) : 53250
DISCHARGE (LPW) : 106.5
DUTY HEAD : 10 METER



	INPUT POWER (Wp)					
	500	400	350	300	250	225
HEAD (m)	FLOW IN LPM					
10	158	124	99	56	12	0

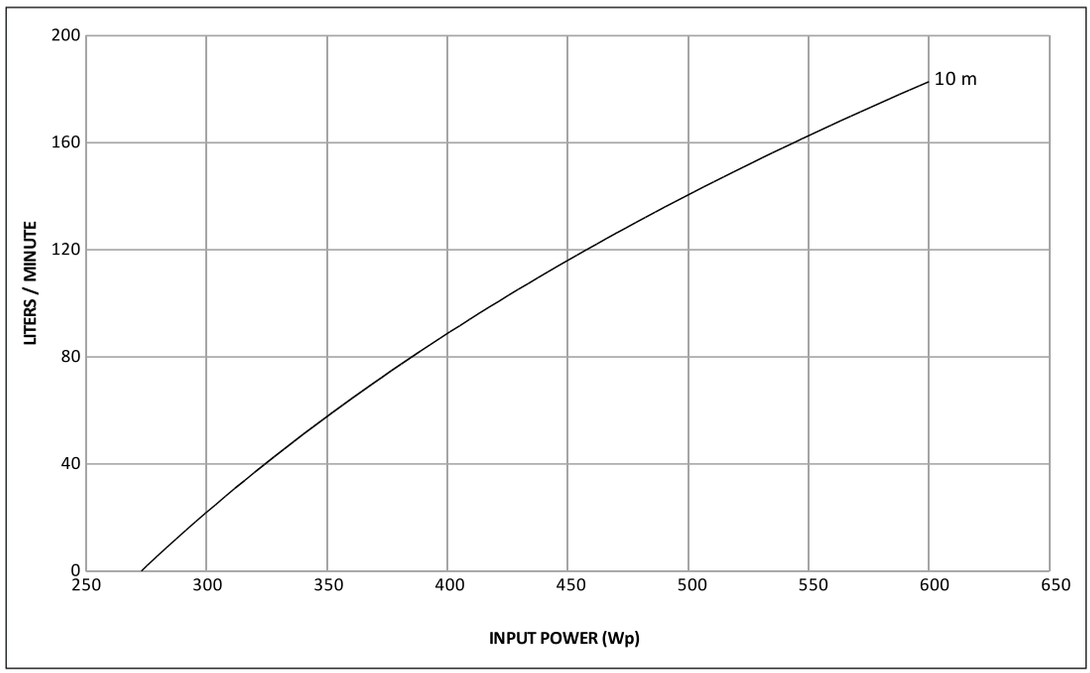
DIMENSIONAL -



Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
50 mm	50 mm

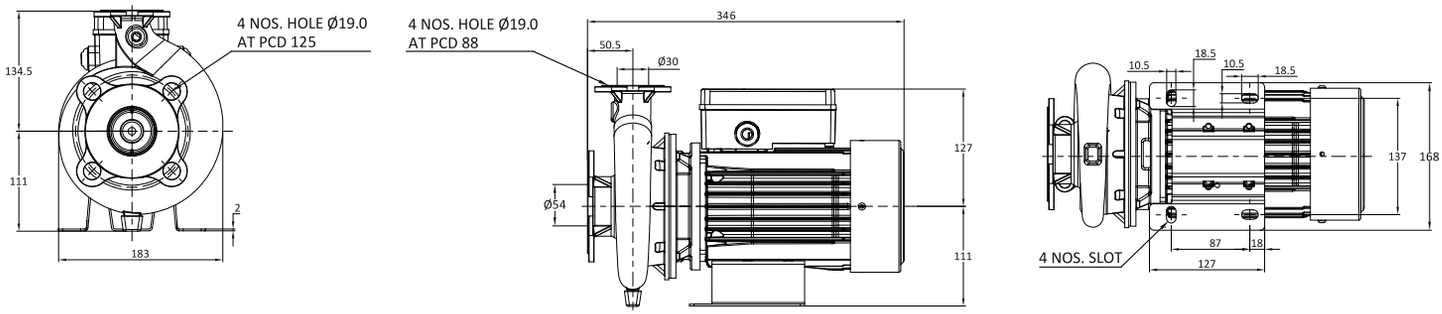
SOLAR 11 DCSMP 600

PUMPSET CODE : 9500001623
DISCHARGE (LPD) : 55200
DISCHARGE (LPW) : 92
DUTY HEAD : 10 METER



	INPUT POWER (Wp)						
	600	550	475	400	350	300	275
HEAD (m)	FLOW IN LPM						
10	180	158	130	100	62	14	0

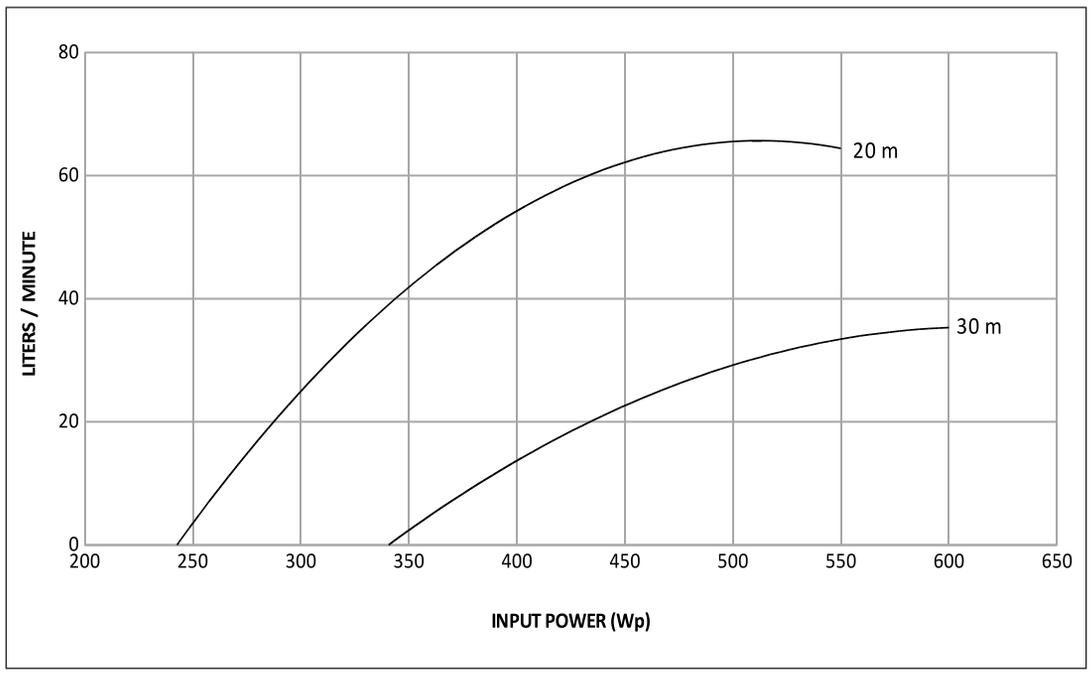
DIMENSIONAL -



Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
50 mm	50 mm

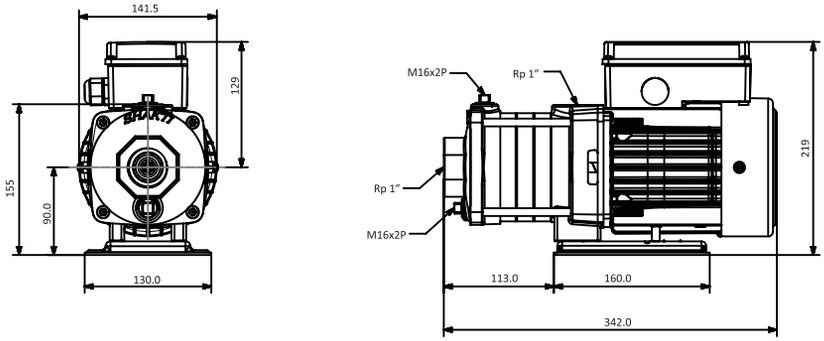
SOLAR 2 DCSMP 600

PUMPSET CODE : 9500001747
DISCHARGE (LPD) : 26400/10500
DISCHARGE (LPW) : 44/17.5
DUTY HEAD : 20/30 METER



A	INPUT POWER (Wp)				
	600	550	475	400	350
HEAD (m)	FLOW IN LPM				
30	37	31	25	18	0
B	INPUT POWER (Wp)				
	550	400	350	300	250
HEAD (m)	FLOW IN LPM				
20	65	52	40	32	0

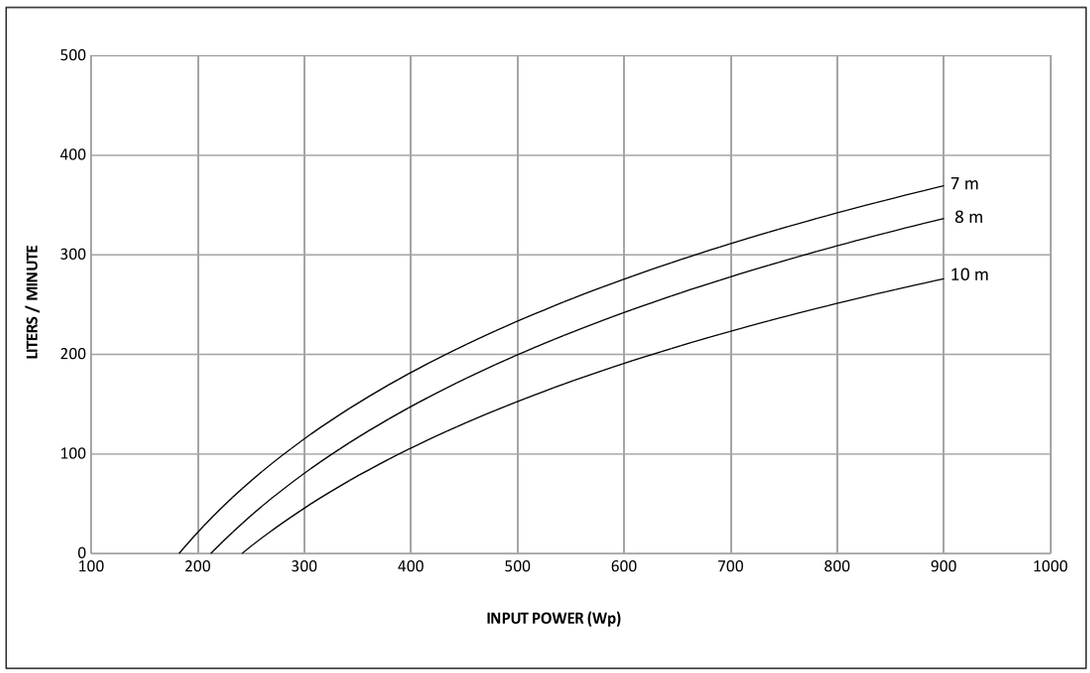
DIMENSIONAL -



Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
25 mm	25 mm

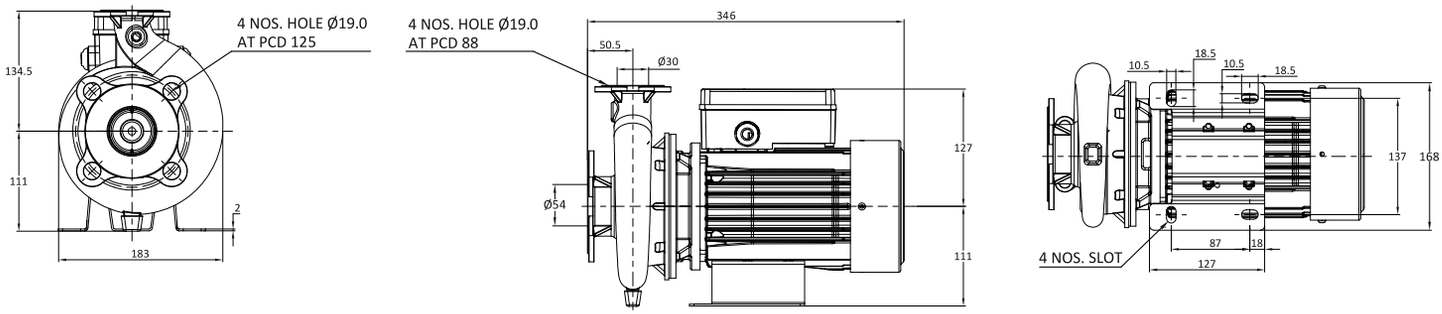
SOLAR 15 DCSMP 900

PUMPSET CODE : 9500001031
DISCHARGE (LPD) : 105300
DISCHARGE (LPW) : 117
DUTY HEAD : 10 METER



	INPUT POWER (Wp)						
	900	700	550	300	250	200	150
HEAD (m)	FLOW IN LPM						
10	270	230	172	53	0		
8	338	288	215	66	35	0	
7	386	329	246	76	40	25	0

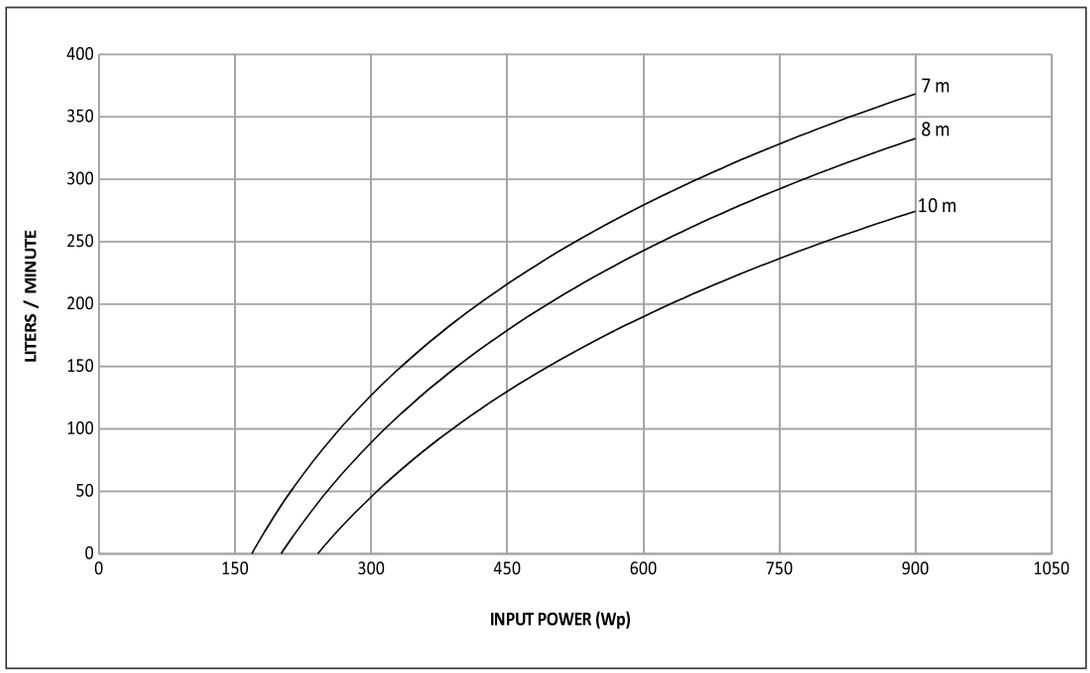
DIMENSIONAL -



Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
50 mm	50 mm

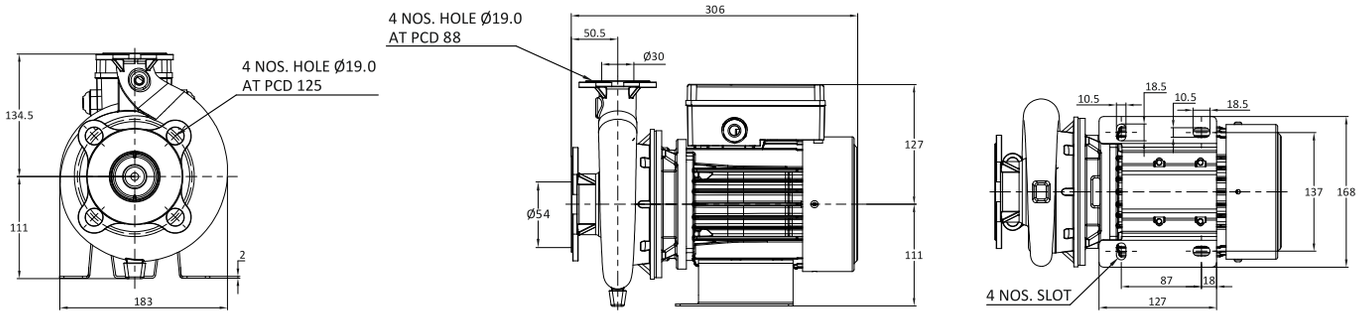
SOLAR 15 DCSMP 900*

PUMPSET CODE : 9500001761
DISCHARGE (LPD) : 106200
DISCHARGE (LPW) : 118
DUTY HEAD : 10 METER



	INPUT POWER (Wp)						
	900	750	550	450	250	200	150
HEAD (m)	FLOW IN LPM						
10	265	236	183	136	0		
8	331	295	229	170	50	0	
7	379	337	261	194	70	30	0

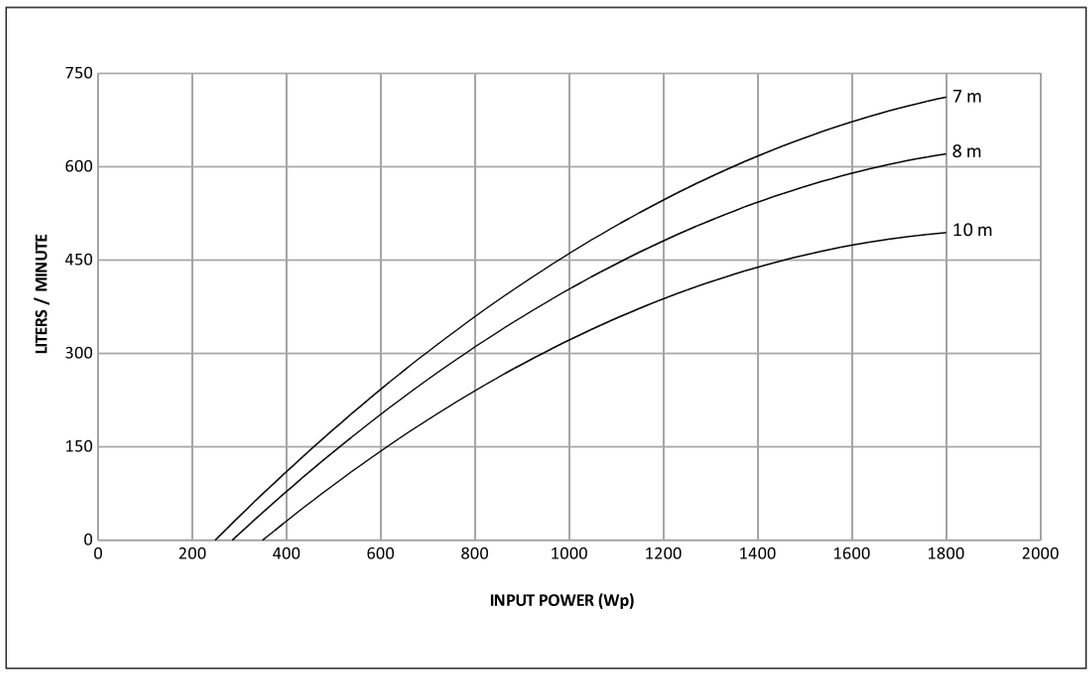
DIMENSIONAL -



Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
50 mm	50 mm

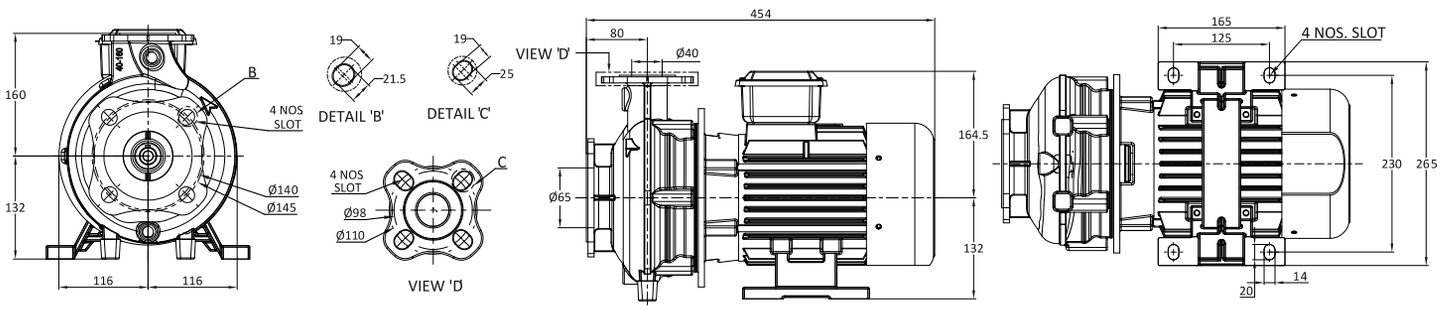
SOLAR 38 DCSMP 1800

PUMPSET CODE : 9500001032
DISCHARGE (LPD) : 218700
DISCHARGE (LPW) : 121.5
DUTY HEAD : 10 METER



	INPUT POWER (Wp)						
	1800	1450	1200	800	350	300	250
HEAD (m)	FLOW IN LPM						
10	497	440	395	240	0		
8	621	550	494	300	60	0	
7	710	629	564	343	80	40	0

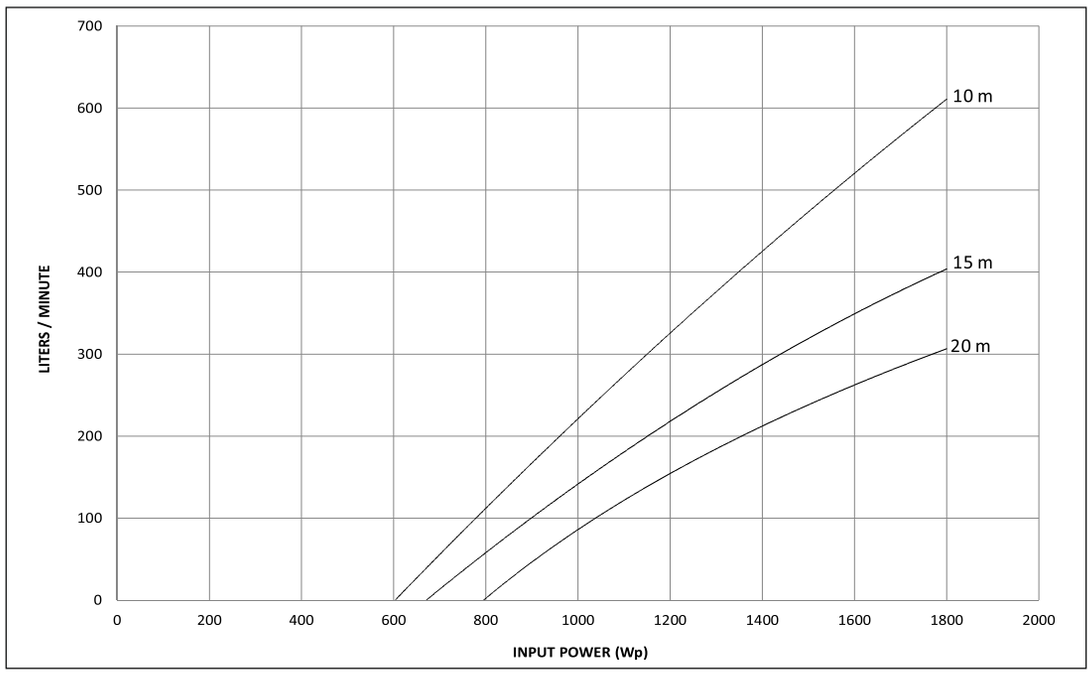
DIMENSIONAL -



Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
75 mm	65 mm

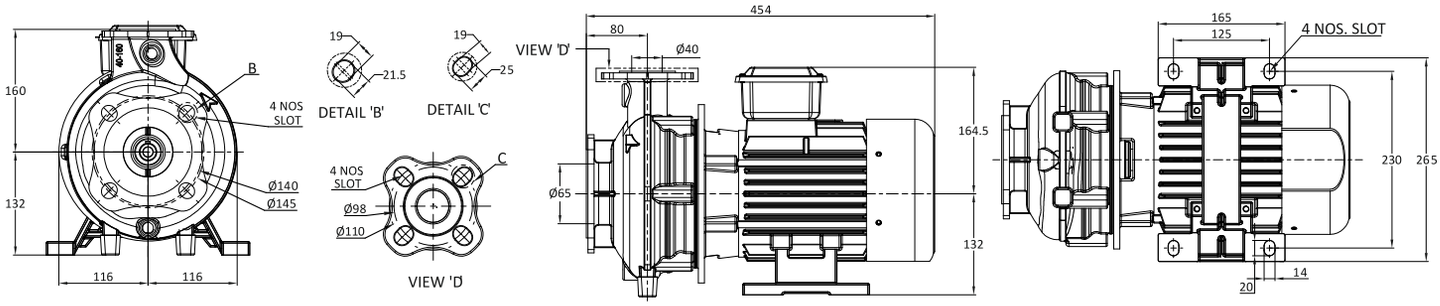
SOLAR 17 DCSMP 1800

PUMPSET CODE : 9500000554
DISCHARGE (LPD) : 106200
DISCHARGE (LPW) : 59
DUTY HEAD : 20 METER



	INPUT POWER (Wp)						
	1800	1600	1439	1258	800	700	600
HEAD (m)	FLOW IN LPM						
20	304	265	217	180	0		
15	405	353	289	240	75	0	
10	608	530	434	360	110	55	0

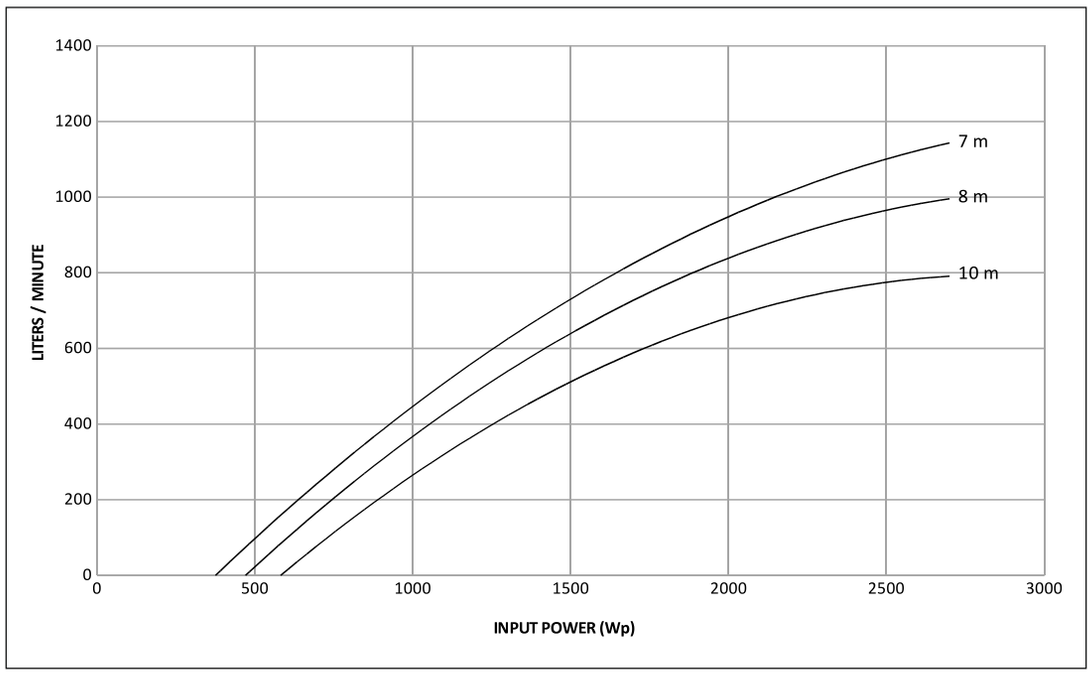
DIMENSIONAL -



Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
65 mm	65 mm

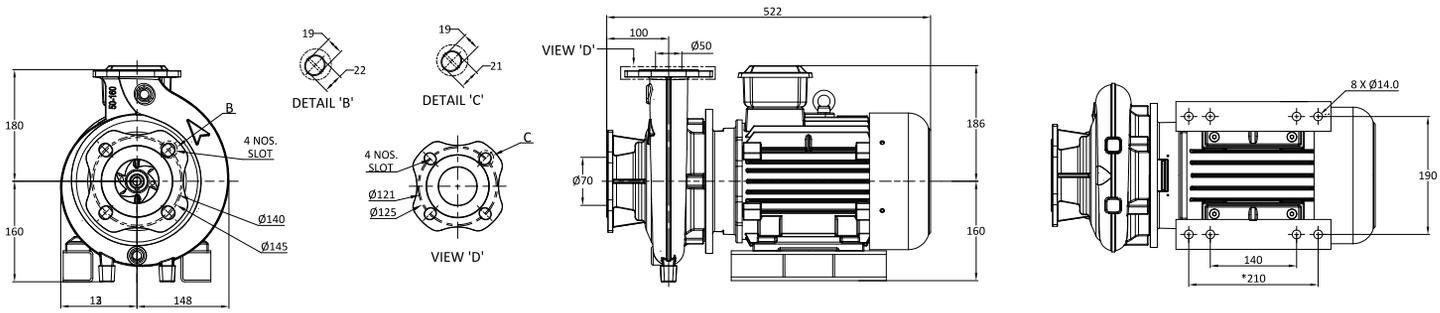
SOLAR 48 DCSMP 2700

PUMPSET CODE : 9500001034
DISCHARGE (LPD) : 334800
DISCHARGE (LPW) : 124
DUTY HEAD : 10 METER



	INPUT POWER (Wp)						
	2700	2200	1650	1100	600	500	400
HEAD (m)	FLOW IN LPM						
10	800	714	561	348	0		
8	1000	893	701	435	120	0	
7	1143	1020	801	497	200	100	0

DIMENSIONAL -

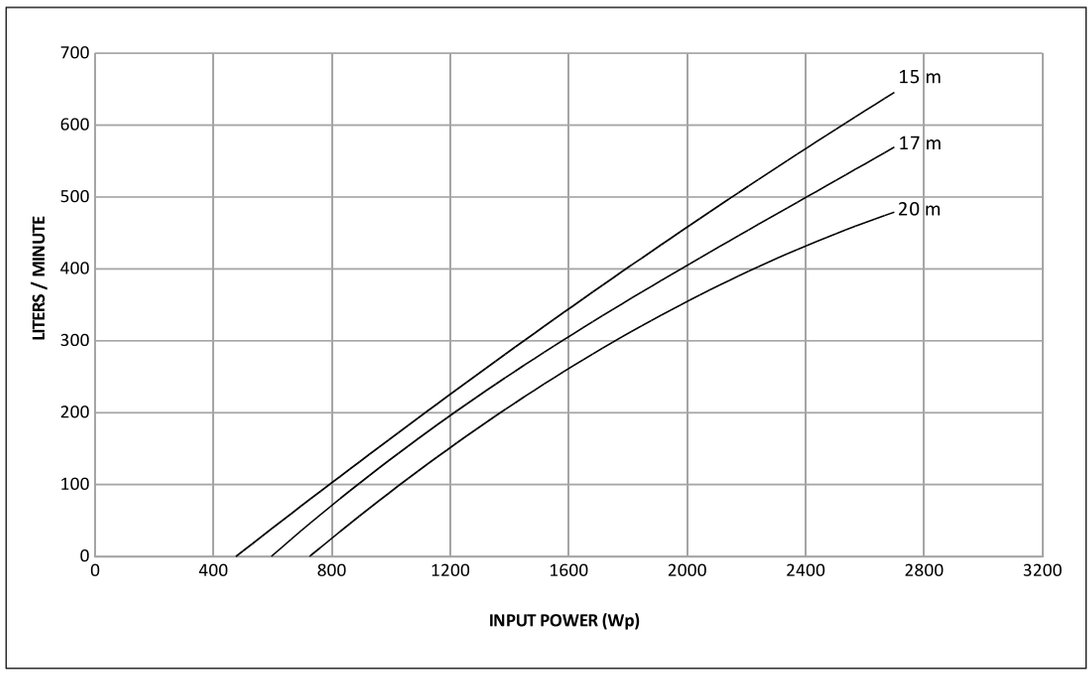


Note:- * Mark dimension recommended for base frame/ground bolting

Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
75 mm	75 mm

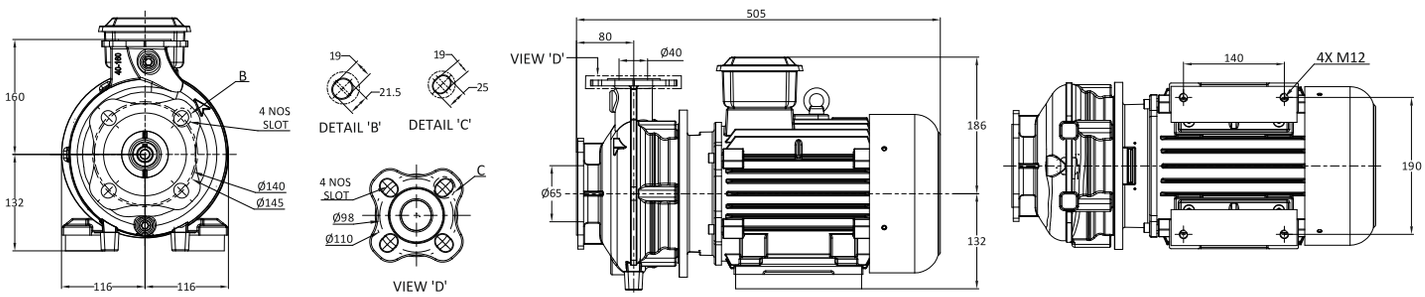
SOLAR 30 DCSMP 2700

PUMPSET CODE : 9500001038
DISCHARGE (LPD) : 166050
DISCHARGE (LPW) : 61.5
DUTY HEAD : 20 METER



	INPUT POWER (Wp)						
	2700	2150	1600	1200	750	600	500
HEAD (m)	FLOW IN LPM						
20	483	379	252	172	0		
17	568	446	296	202	55	0	
15	644	505	336	229	85	50	0

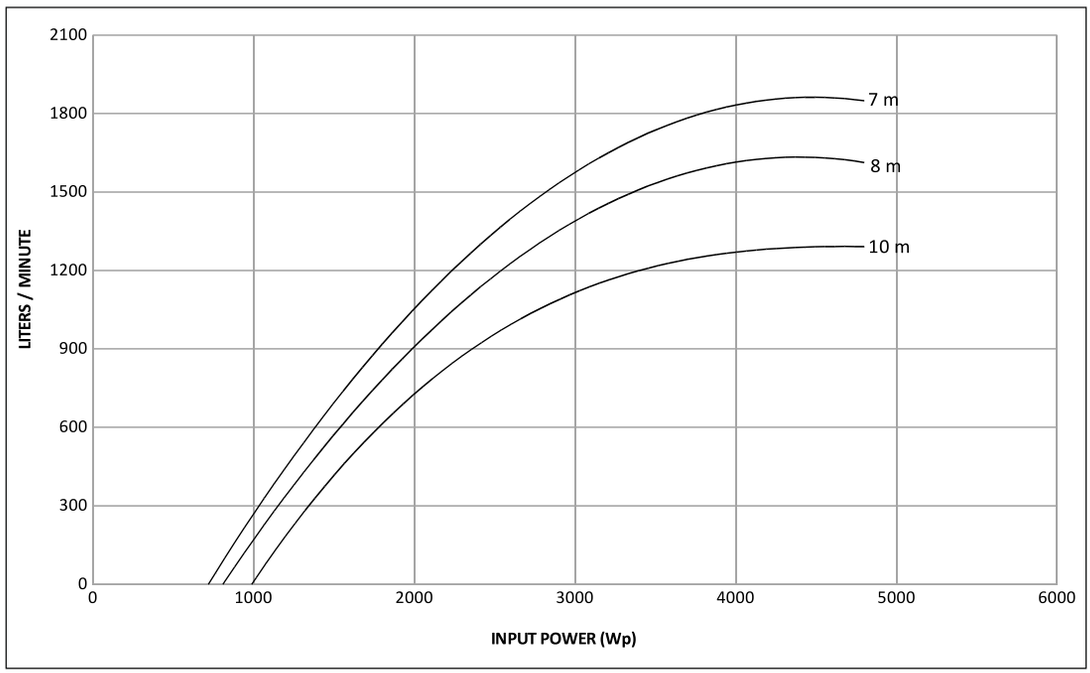
DIMENSIONAL -



Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
75 mm	65 mm

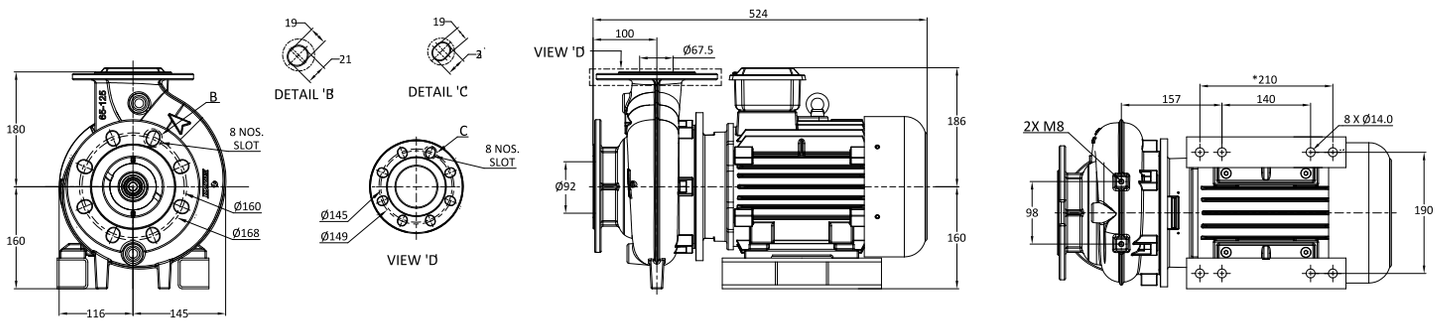
SOLAR 88 DCSMP 4800

PUMPSET CODE : 9500001066
DISCHARGE (LPD) : 645600
DISCHARGE (LPW) : 134.5
DUTY HEAD : 10 METER



	INPUT POWER (Wp)						
	4800	3350	2400	1450	1000	800	700
HEAD (m)	FLOW IN LPM						
10	1290	1200	898	400	0		
8	1613	1500	1123	550	150	0	
7	1843	1714	1283	650	250	80	0

DIMENSIONAL -

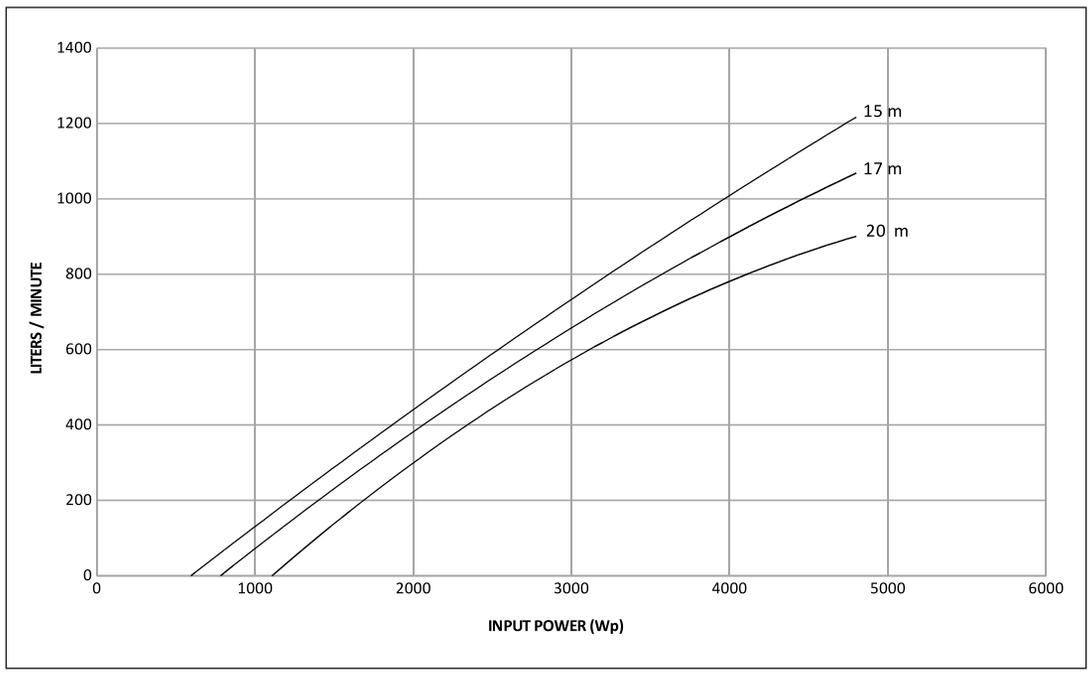


Note:- * Mark dimension recommended for base frame/ground bolting

Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
100 mm	100 mm

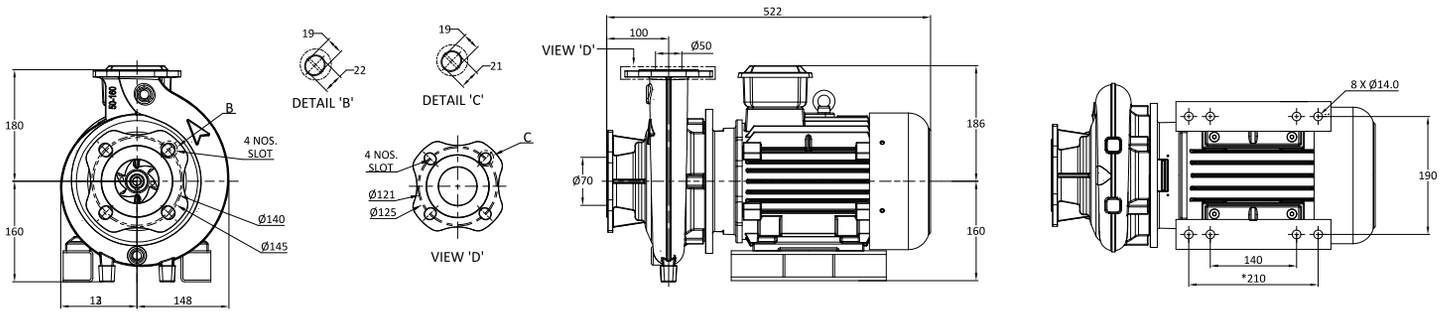
SOLAR 53 DCSMP 4800

PUMPSET CODE : 9500001178
DISCHARGE (LPD) : 312000
DISCHARGE (LPW) : 65
DUTY HEAD : 20 METER



	INPUT POWER (Wp)						
	4800	3500	2500	1600	1200	800	600
HEAD (m)	FLOW IN LPM						
20	909	663	448	216	0		
17	1069	780	527	254	150	0	
15	1212	884	597	288	200	80	0

DIMENSIONAL -

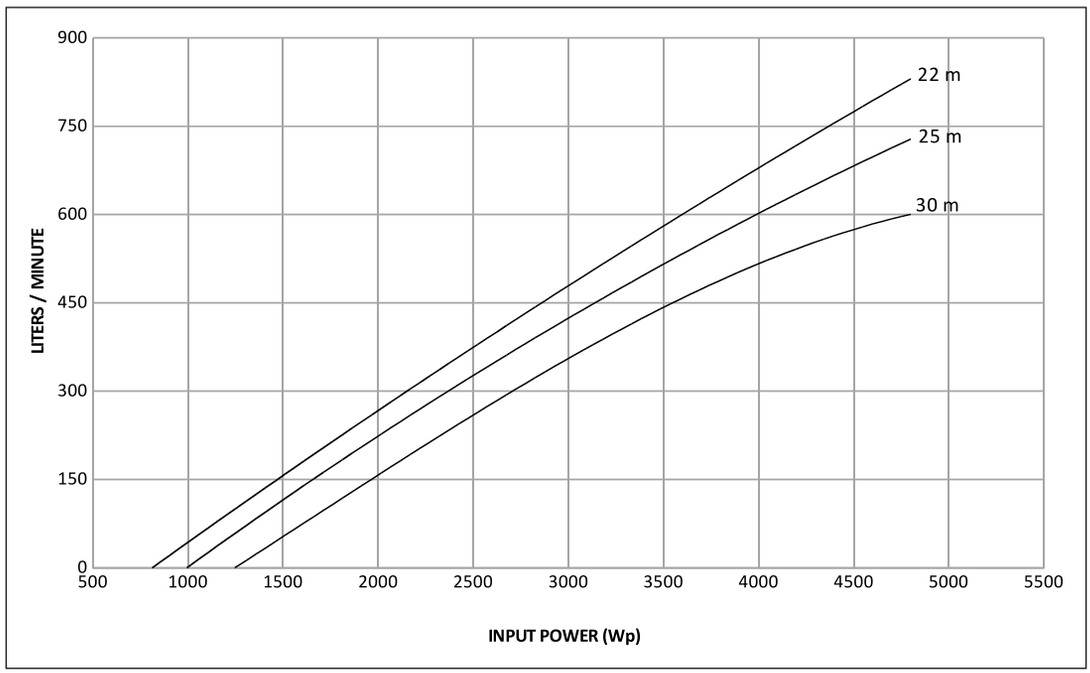


Note:- * Mark dimension recommended for base frame/ground bolting

Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
75 mm	65 mm

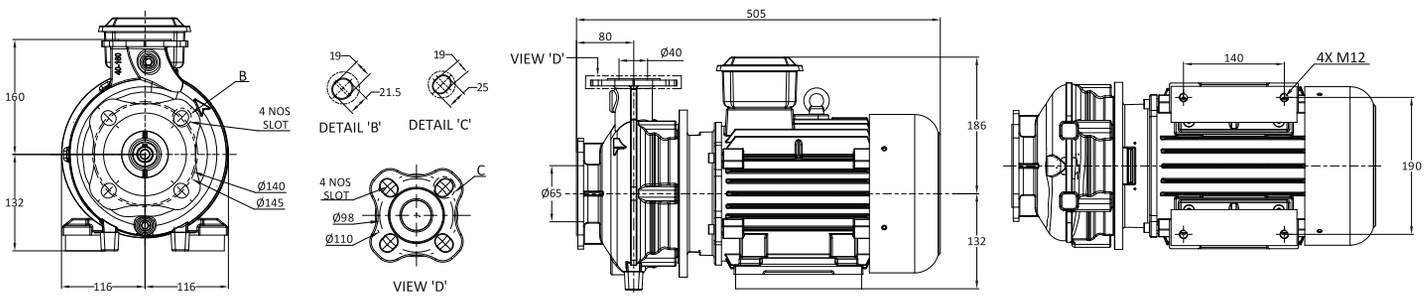
SOLAR 39 DCSMP 4800

PUMPSET CODE : 9500001187
DISCHARGE (LPD) : 201600
DISCHARGE (LPW) : 42
DUTY HEAD : 30 METER



	INPUT POWER (Wp)						
	4800	3800	2800	2000	1250	1000	800
HEAD (m)	FLOW IN LPM						
30	600	490	315	160	0		
25	720	588	378	210	70	0	
22	818	668	430	250	100	50	0

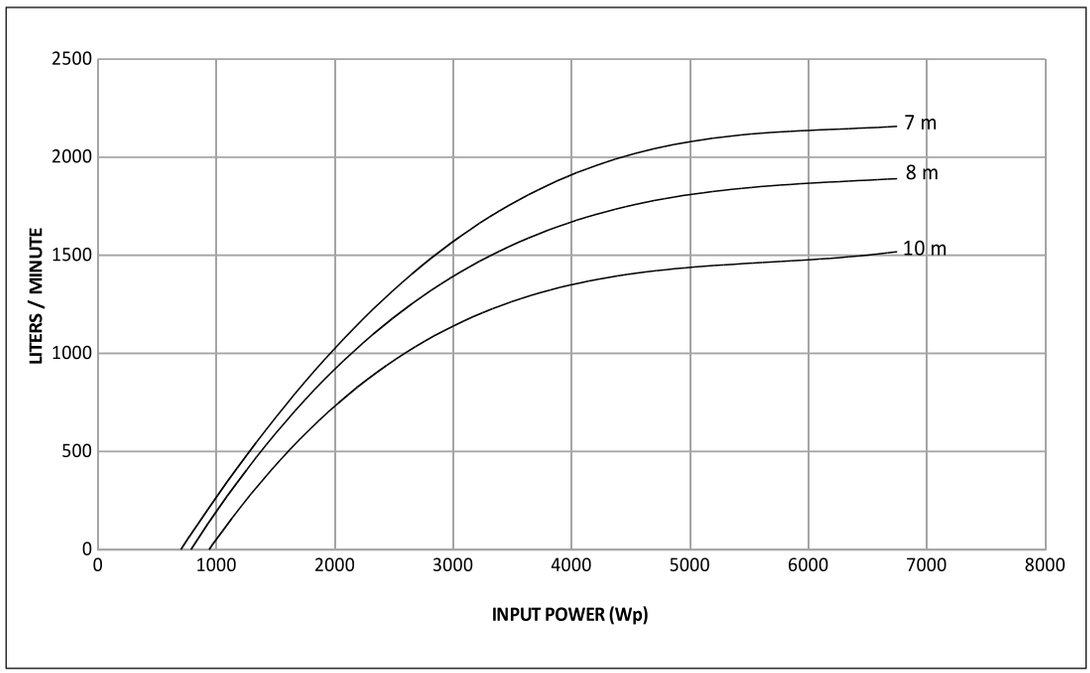
DIMENSIONAL -



Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
75 mm	65 mm

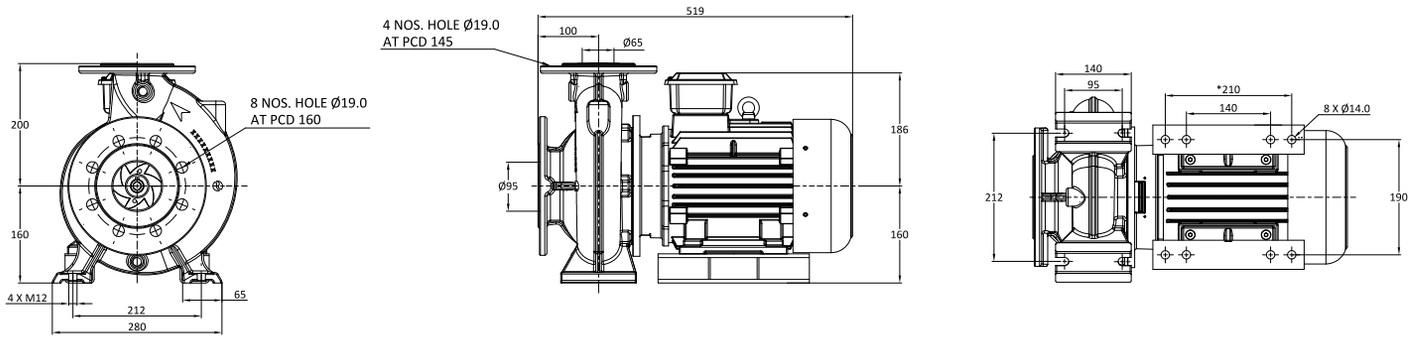
SOLAR 146 DCSMP 6750

PUMPSET CODE : 9500001325
DISCHARGE (LPD) : 901125
DISCHARGE (LPW) : 133.5
DUTY HEAD : 10 METER



	INPUT POWER (Wp)						
	6750	5450	3400	1350	1000	800	700
HEAD (m)	FLOW IN LPM						
10	1510	1480	1210	395	0		
8	1888	1850	1513	494	200	0	
7	2157	2114	1729	564	250	100	0

DIMENSIONAL -

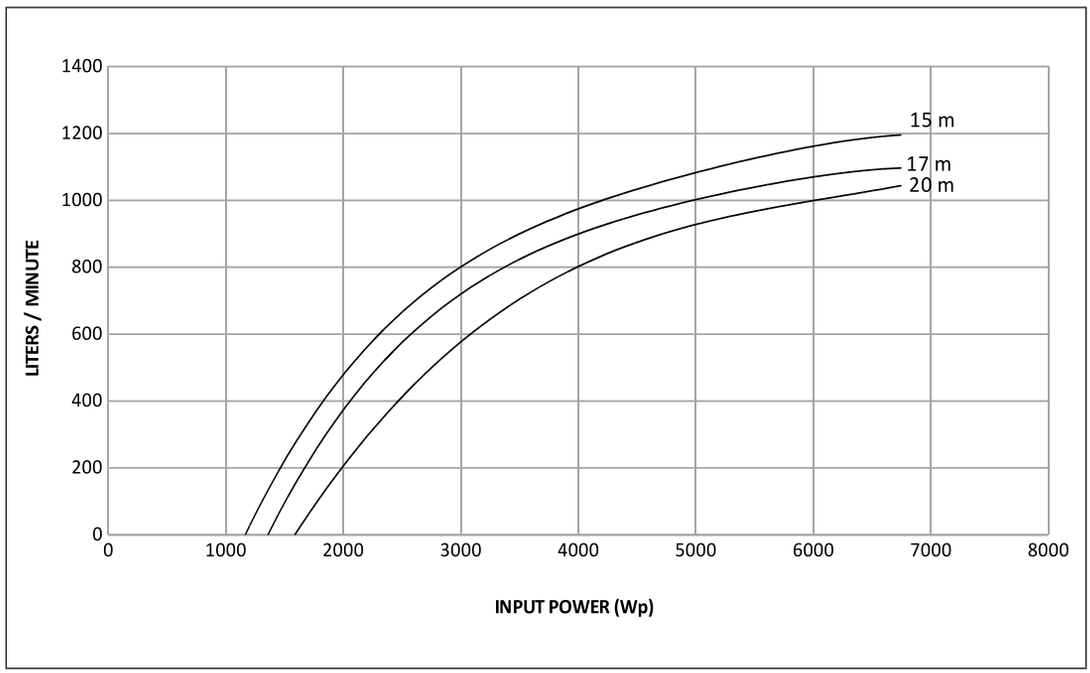


Note:- * Mark dimension recommended for base frame/ground bolting

Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
100 mm	100 mm

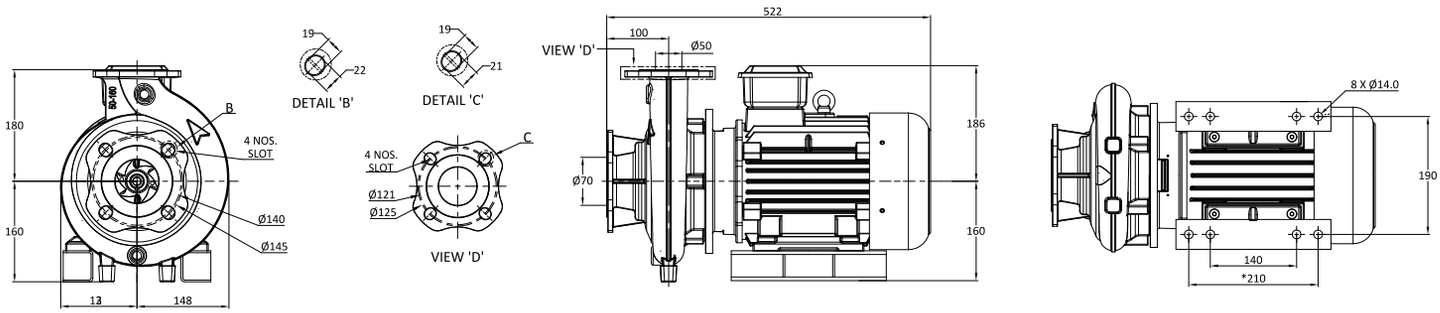
SOLAR 67 DCSMP 6750

PUMPSET CODE : 9500001379
DISCHARGE (LPD) : 465750
DISCHARGE (LPW) : 69
DUTY HEAD : 20 METER



	INPUT POWER (Wp)						
	6750	6100	4075	2700	1600	1400	1200
HEAD (m)	FLOW IN LPM						
20	1032	1028	790	505	0		
17	1100	1070	920	620	200	0	
15	1200	1160	1000	700	300	180	0

DIMENSIONAL -

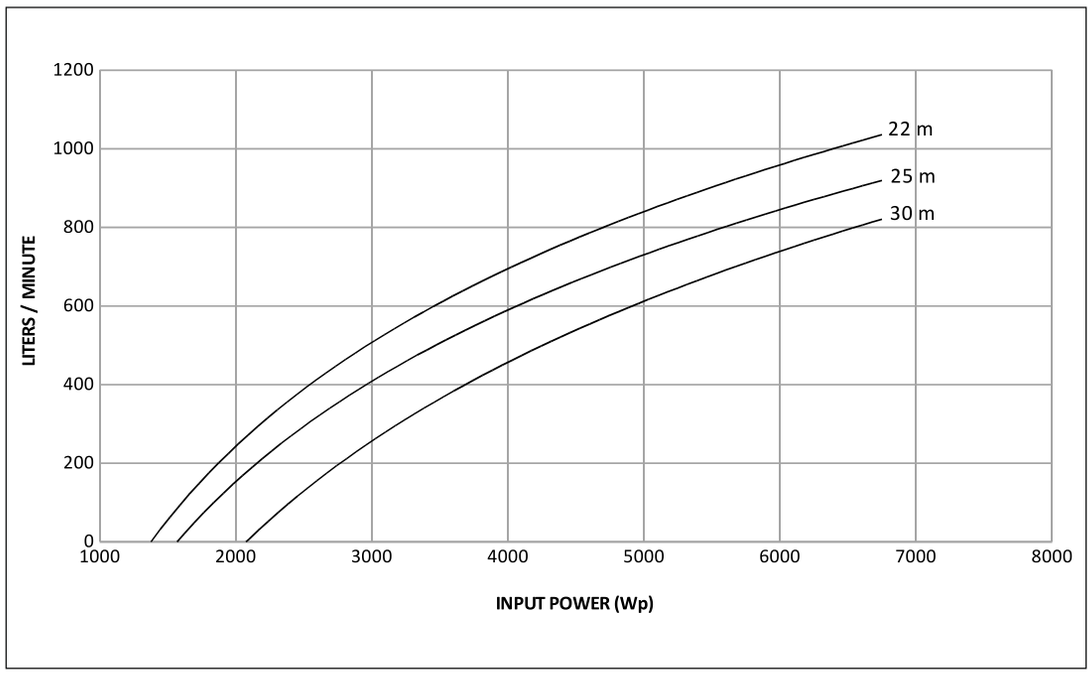


Note:- * Mark dimension recommended for base frame/ground bolting

Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
100 mm	75 mm

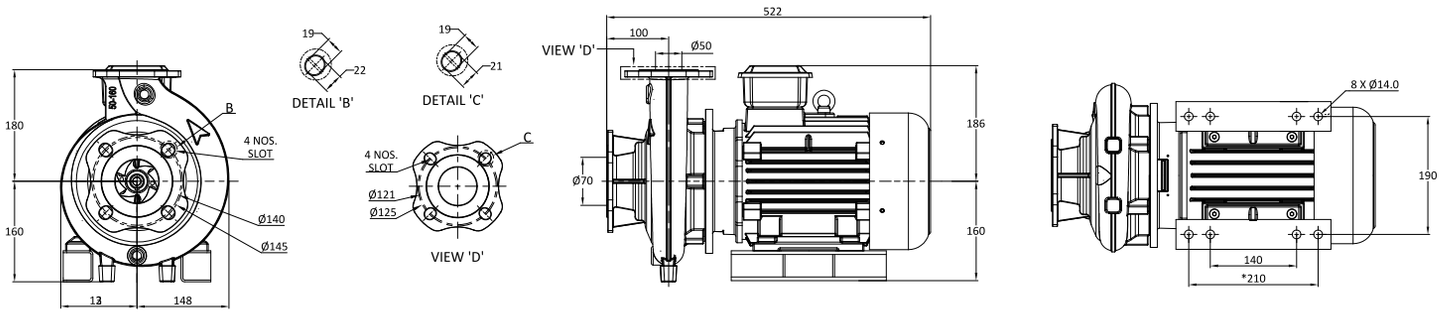
SOLAR 48 DCSMP 6750

PUMPSET CODE : 9500001392
DISCHARGE (LPD) : 297000
DISCHARGE (LPW) : 44
DUTY HEAD : 30 METER



	INPUT POWER (Wp)						
	6750	5450	3350	2600	2200	1650	1500
HEAD (m)	FLOW IN LPM						
30	800	685	350	190	0		
25	900	780	500	368	200	0	
22	1010	900	600	447	300	150	0

DIMENSIONAL -

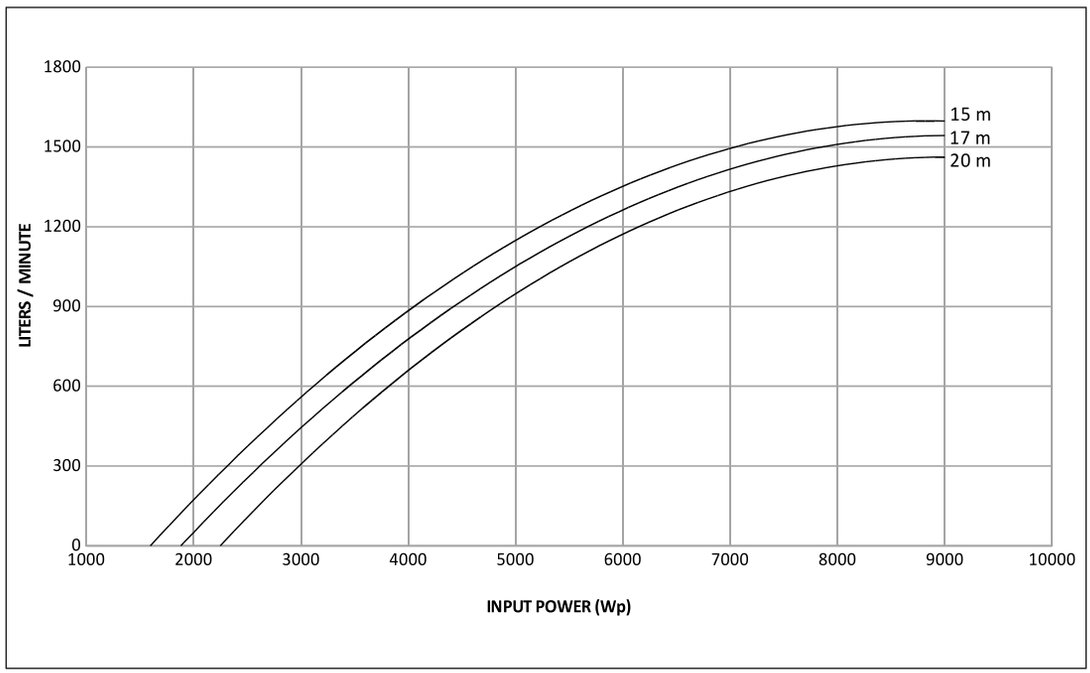


Note:- * Mark dimension recommended for base frame/ground bolting

Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
75 mm	75 mm

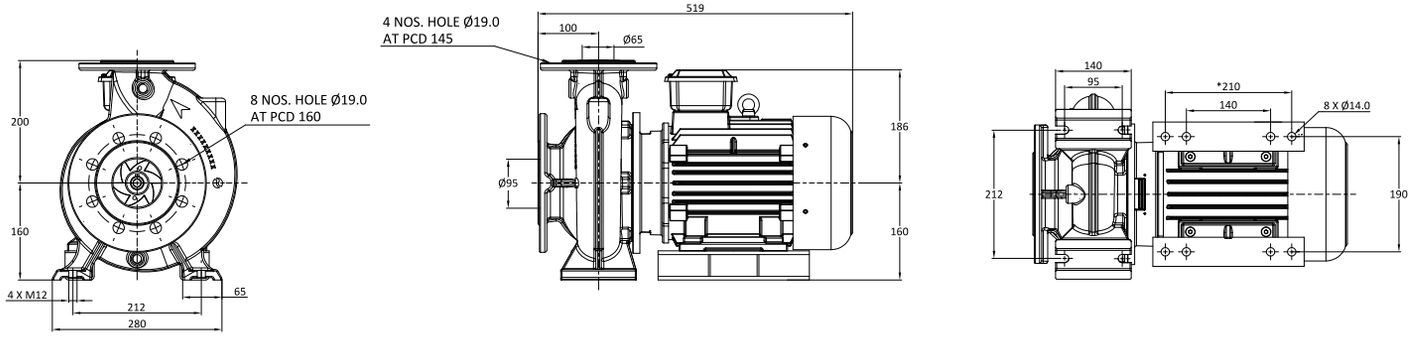
SOLAR 101 DCSMP 9000

PUMPSET CODE : 9500001414
DISCHARGE (LPD) : 639000
DISCHARGE (LPW) : 71
DUTY HEAD : 20 METER



	INPUT POWER (Wp)						
	9000	6300	4500	3150	2300	2000	1600
HEAD (m)	FLOW IN LPM						
20	1465	1220	800	400	0		
17	1550	1300	900	550	200	0	
15	1600	1400	1000	650	300	150	0

DIMENSIONAL -

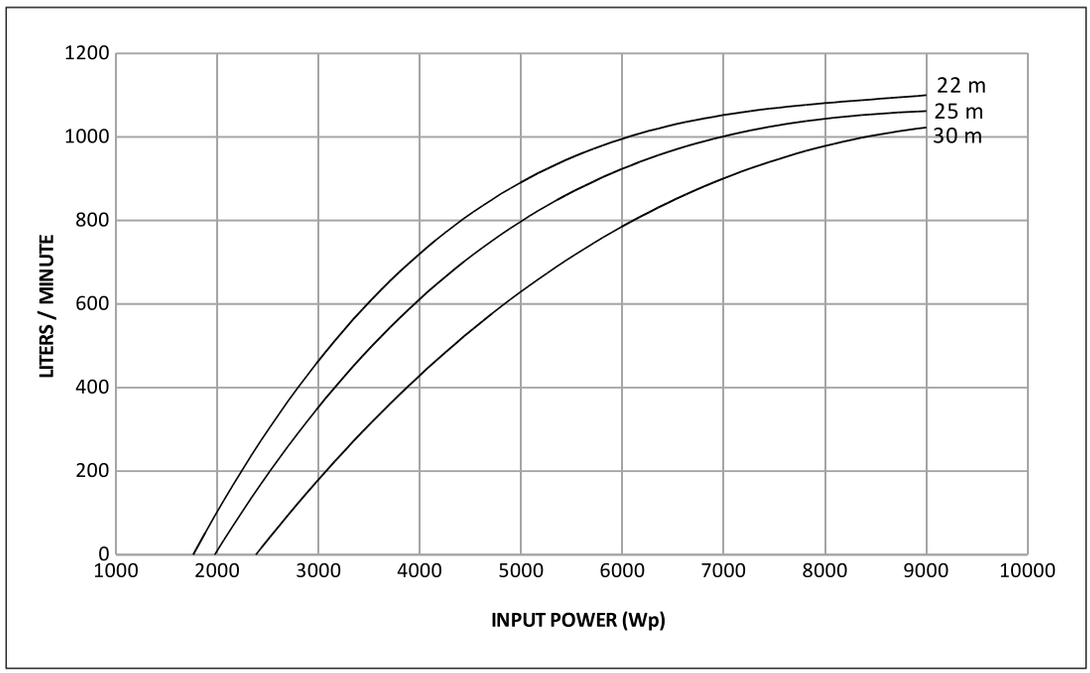


Note:- * Mark dimension recommended for base frame/ground bolting

Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
100 mm	100 mm

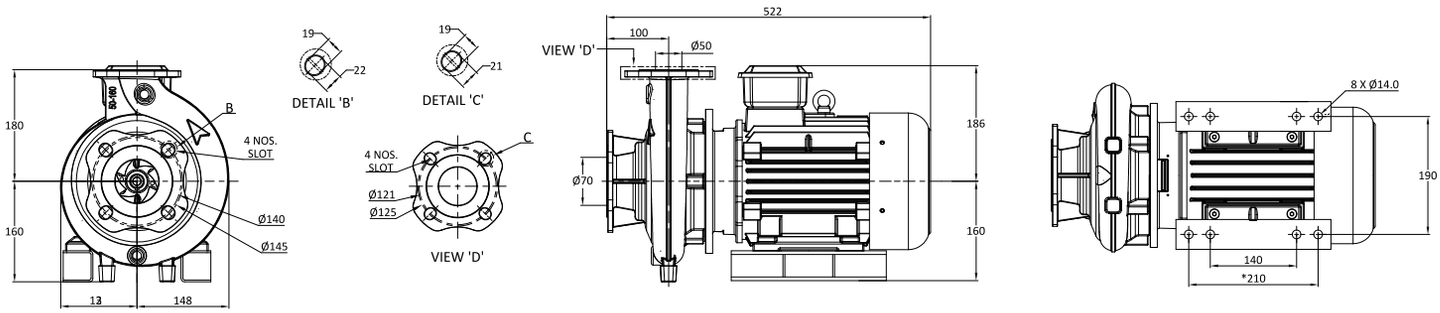
SOLAR 67 DCSMP 9000

PUMPSET CODE : 9500001415
DISCHARGE (LPD) : 436500
DISCHARGE (LPW) : 48.5
DUTY HEAD : 30 METER



	INPUT POWER (Wp)						
	9000	7200	5400	3600	2400	2000	1800
HEAD (m)	FLOW IN LPM						
30	1020	930	680	350	0		
25	1060	1020	845	520	170	0	
22	1100	1060	940	630	250	130	0

DIMENSIONAL -



Note:- * Mark dimension recommended for base frame/ground bolting

Recommended suction and delivery pipe size	
Suction flange size	Delivery flange size
100 mm	75 mm

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