

# DAVIS & SHIRTLIFF

*know **H<sub>2</sub>O**w through experience*

## **Borehole Manual**

### **Issue 3**



## **Best Borehole Solutions Available!**

# BOREHOLE MANUAL

Davis & Shirtliff is the Region's leading supplier of Borehole equipment with over seventy years' experience in the industry. This Manual has been compiled using the benefit of this extensive experience and gives details of the wide range of products offered including an unmatched range of quality pumps from Dayliff, Grundfos, Pedrollo and Lorentz, a complete range of Solar borehole equipment, various Controller options including smart electronic and standard control panels and a complete range of accessories including Piping, Cable, Wellheads, Meters and On-line Chlorinators. All items are tried and tested quality products that have been proven over many years' service and offer guaranteed quality and excellent value. Also included in the Manual are Reference sections giving installation and operating guidelines and various relevant technical data. This will help to ensure that the right equipment is specified for every installation and operating problems are minimized.

This Manual supplements Davis & Shirtliff's Digital Platforms which offer full information and support for the wide Borehole pump product range and also give access to the unique D&S FLO Application available on Google Play and App Stores. The App offers accurate pump selection and sizing for particular applications and also provides system curves and full product specifications.

Another important Davis & Shirtliff initiative is the iDayliff remote monitoring digital interface. This enables remote pump control and the monitoring of various operating parameters through GPRS in addition to user monitoring via the D&S iDayliff 2.0 App Service which optimizes operating reliability through service contracts offered by the D&S Service Division. This is a unique Davis & Shirtliff advantage that maximizes borehole efficiencies through pre-emptive rather than reactive service and trouble shooting.

All products are stock items available either immediately or at short notice from the Nairobi Distribution Centre or through the network of Davis & Shirtliff branches, subsidiaries and other approved stockists. Also a direct ordering and delivery service is available, which saves time and money and customers are encouraged to use this facility by contacting [customerservice@dayliff.com](mailto:customerservice@dayliff.com) or [accessing the D&S e-shop at www.davisandshirtliff.com](http://www.davisandshirtliff.com) or on the D&S FLO App.

Great benefit will be gained from using this Manual by all those installing and maintaining borehole equipment that will lead to effective and economic water supply solutions for the end user.





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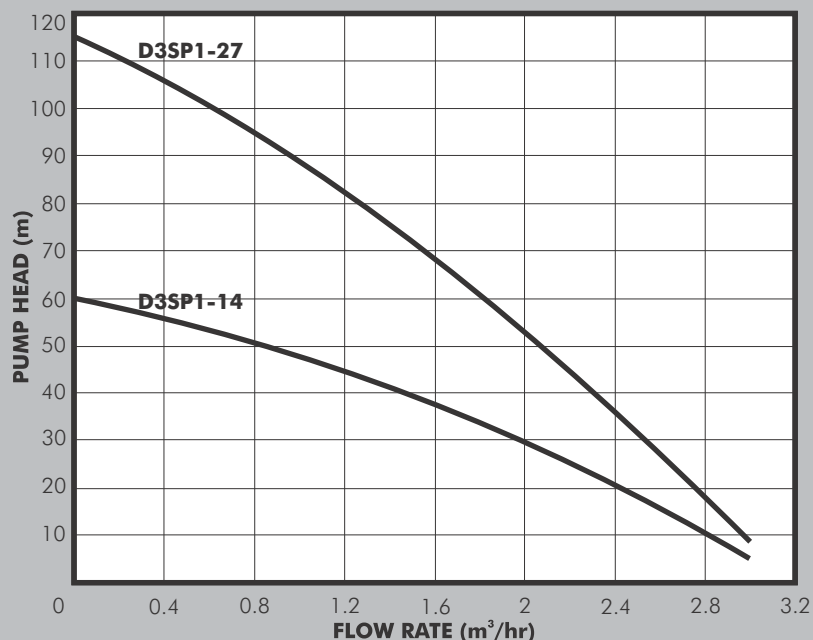






# D3SP1

## Submersible Borehole Pump



### PUMP

DAYLIFF D3SP pumps are compact 3" diameter submersible multistage centrifugal pumps specifically designed for small scale water supplies from boreholes and wells. Material of construction is engineering plastic impellers and diffusers, brass inlet and outlet chambers and stainless steel pump sleeve. All pumps are provided with 20m cable and a control unit.

### MOTOR

The pump is coupled to a two pole sealed motor with copper windings and constructed principally from stainless steel. A separate control unit is included which incorporates an isolator, run indicator light, thermal overload protection and start capacitor which can be connected directly to mains power. The controller is also provided with auxiliary terminals for control probes, pressure switch or float switch. Additional protection by a DAYLIFF AVS or similar power protection controller is recommended.

**Enclosure Class:** IP68

**Insulation Class:** B

**Speed:** 2900rpm

**Voltage:** 1X240V

### OPERATING PARAMETERS

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids

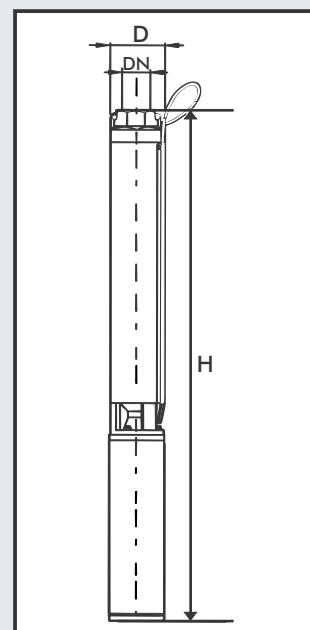
**Max Liquid Temperature:** 40°C

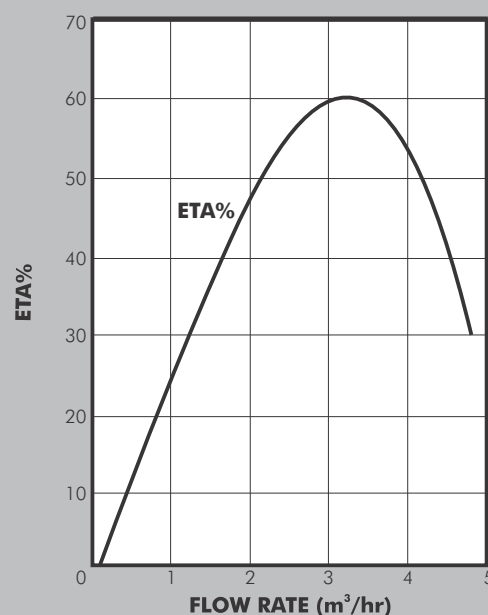
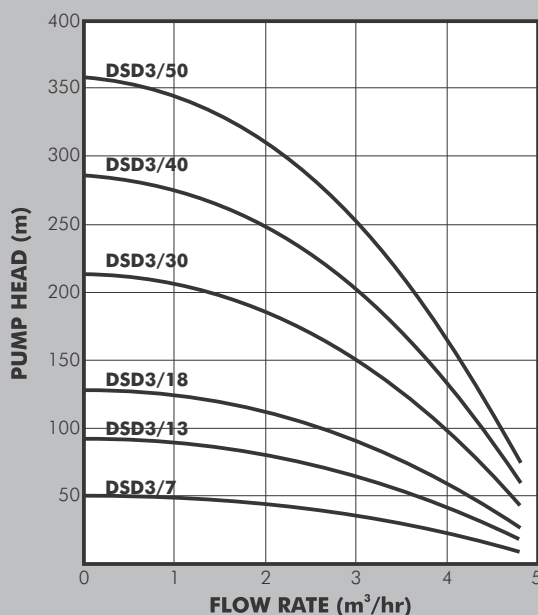
**Max Ambient Temperature:** 50°C

**Max Immersion Depth:** 35m

**Min Borehole Drive:** 100mm

Model	Power Required		Max Current (A)	Outlet DN (")	Dimensions (mm)		Weight (kg)
	kW	HP			D	H	
D3SP1-14	0.37	0.55	3.3	1"	76	85	12
D3SP1-27	0.75	1.0	6.3			106	14





#### PUMP

Dayliff DSD range of Submersible Multistage centrifugal pumps are specially designed for domestic and small scale water supply from wells and boreholes. Material of construction include polycarbonate impellers and diffusers, cast iron delivery and suction chambers and AISI 304 stainless steel pump housing, shaft and shaft coupling. These quality materials together with the polycarbonate impellers provide the pumps with excellent sand handling capabilities for a longer life. DSD 3/7, 3/13 and 3/18 are supplied complete with 30m cable and control box.

#### MOTOR

The pump is coupled to a sealed liquid cooled 2-pole asynchronous squirrel-cage motor constructed of stainless steel. Single phase motors should be supplied with purpose designed Dayliff SCM control boxes for operation and protection against overload, dry running and over/under voltage. Three phase motors require a remote DOL starter; A DAYLIFF SCT electronic Pump Controller is recommended for comprehensive pump control including low level, motor overload and irregular power supply protection.

**Enclosure Class:** IP68

**Insulation Class:** B

**Speed:** 2850rpm

#### OPERATING CONDITIONS

**Pumped liquid:** Thin, clean, chemically non-aggressive liquids with a max. sand content of 0.25%

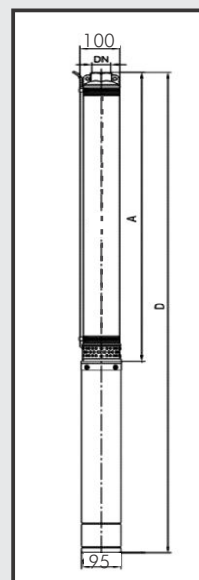
**Max. Water temperature:** +35°C

**Max. immersion depth:** 150m

**Min. borehole diameter:** 110mm

#### PUMP DATA

Model	Power		Voltage (V)	Current (A)	Istat I	DN (")	Dimensions (mm)		Weight (kg)
	kW	HP					A	D	
DSD 3/7	0.37	0.5	1x240	3.7	4	1 1/4	410	717	10
DSD 3/13	0.75	1		6.2	4		568	920	14
DSD 3/18	1.1	1.5		8	4		673	1065	17
DSD 3/30	2.2	3		15	4		1047	1564	27
DSD 3/40	3	4	3x415	8	7		1341	1923	32
DSD 3/50	4	5.5		10	7		1604	2261	38

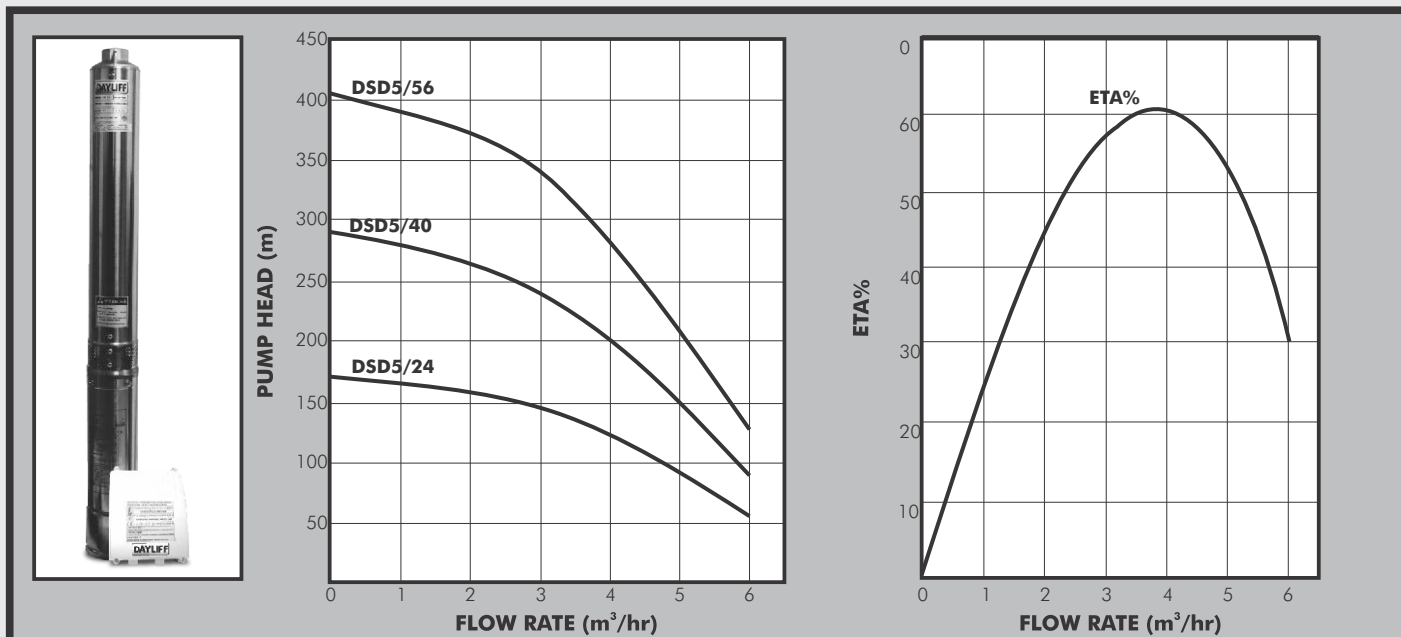






# DSD5

## Submersible Borehole Pumps



### PUMP

Dayliff DSD range of Submersible Multistage centrifugal pumps are specially designed for water supply from wells and boreholes. Material of construction include polycarbonate impellers and diffusers, cast iron delivery and suction chambers and AISI 304 stainless steel pump housing, shaft and shaft coupling. These quality materials together with the polycarbonate impellers provide the pumps with excellent sand handling capabilities for a longer life.

### MOTOR

The pump is coupled to a sealed liquid cooled 2-pole asynchronous squirrel-cage motor constructed of stainless steel. Single phase motors should be supplied with purpose designed Dayliff SCM control boxes for operation and protection against overload, dry running and over/under voltage. Three phase motors require a remote DOL starter; A DAYLIFF SCT electronic Pump Controller is recommended for comprehensive pump control including low level, motor overload and irregular power supply protection.

**Enclosure Class:** IP68

**Insulation Class:** B

**Speed:** 2850rpm

### OPERATING CONDITIONS

**Pumped liquid:** Thin, clean, chemically non-aggressive liquids with a max. sand content of 0.25%

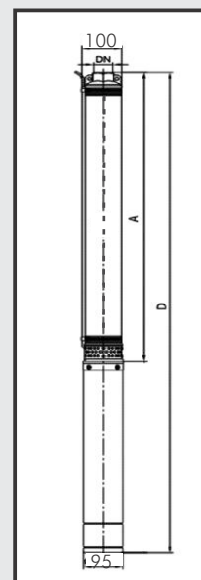
**Max. Water temperature:** +35°C

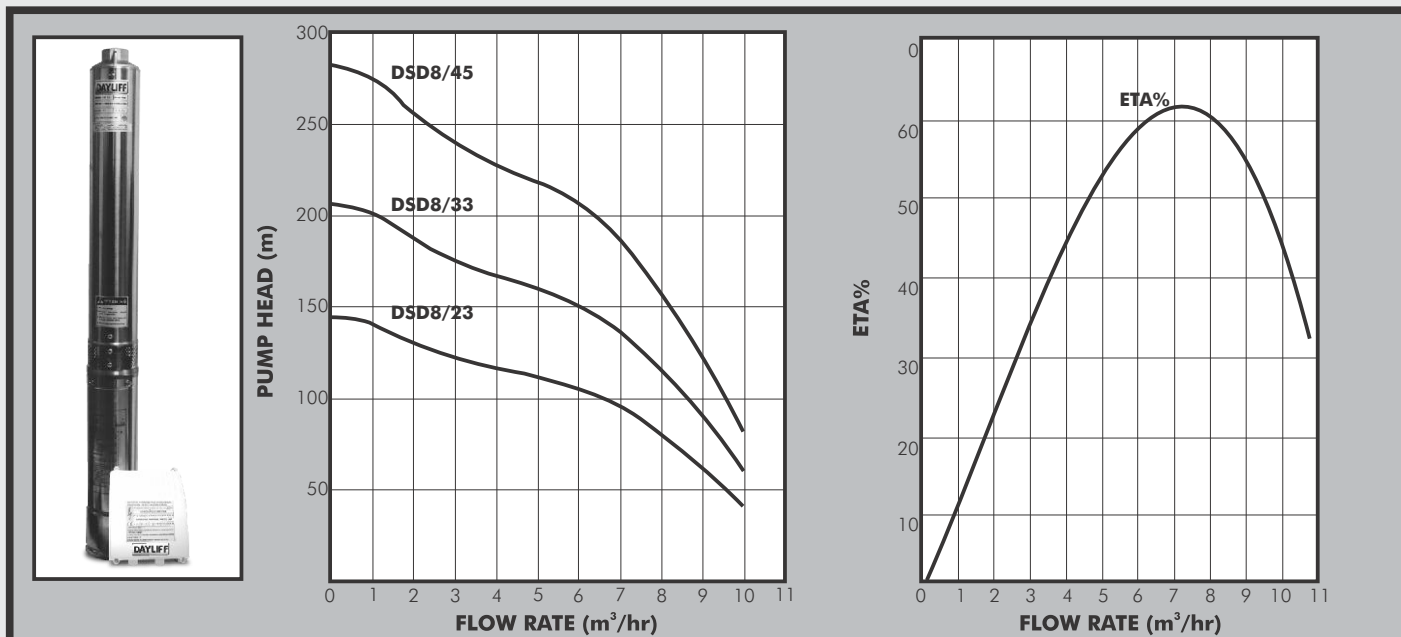
**Max. immersion depth:** 150m

**Min. borehole diameter:** 110mm

### PUMP DATA

Model	Motor		Voltage (V)	Current (A)	Istat I	DN (")	Dimensions (mm)		Weight (kg)
	kW	HP					A	D	
DSD 5/24	2.2	3	1x240	15	4	1½	957	1474	26
DSD 5/40	4	5.5	3x415	10	7		1454	2111	36
DSD 5/56	7.5	10		17	6.5		1951	2787	47





#### PUMP

Dayliff DSD range of Submersible Multistage centrifugal pumps are specially designed for water supply from wells and boreholes. Material of construction include polycarbonate impellers and diffusers, cast iron delivery and suction chambers and AISI 304 stainless steel pump housing, shaft and shaft coupling. These quality materials together with the polycarbonate impellers provide the pumps with excellent sand handling capabilities for a longer life.

#### MOTOR

The pump is coupled to a sealed liquid cooled 2-pole asynchronous squirrel-cage motor constructed of stainless steel. The motors require a remote DOL starter; A DAYLIFF SCT electronic Pump Controller is recommended for comprehensive pump control including low level, motor overload and irregular power supply protection.

**Enclosure Class:** IP68

**Insulation Class:** B

**Speed:** 2850rpm

#### OPERATING CONDITIONS

**Pumped liquid:** Thin, clean, chemically non-aggressive liquids with a max. sand content of 0.25%

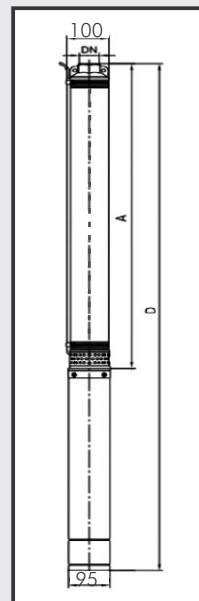
**Max. Water temperature:** +35°C

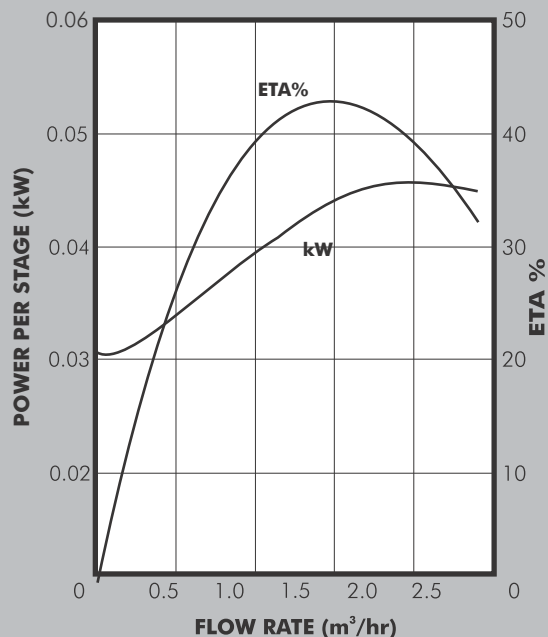
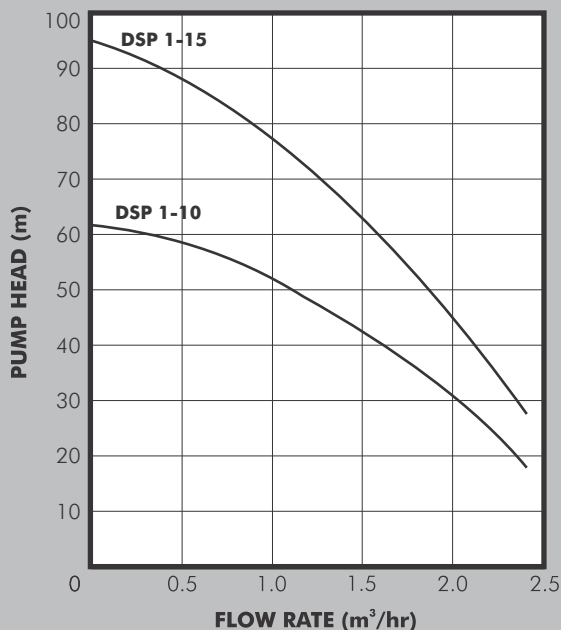
**Max. immersion depth:** 150m

**Min. borehole diameter:** 110mm

#### PUMP DATA

Model	Motor		Voltage (V)	Current (A)	Istat I	DN (")	Dimensions (mm)		Weight (kg)
	kW	HP					A	D	
DSD 8/23	3	4	3x415V	8	6.9	2	1093	1675	28
DSD 8/33	5.5	7.5		13	6.3		1586	2264	35
DSD 8/45	7.5	10		17	6.5		1955	2791	49





#### PUMP

The DAYLIFF DSP range of submersible multistage centrifugal pumps are specially designed for domestic and small scale water supply from wells and boreholes. Material of construction include Noryl impellers, glass filled polycarbonate diffusers, stainless steel inlet and outlet chambers, stage casings, shaft and pump housing. These quality materials together with the floating type impeller design provide the pumps with efficient performance excellent sand handling capabilities and long life.

#### MOTOR

The pump is coupled to a two pole sealed motor constructed principally from stainless steel. A separate control box is also available which incorporates an isolator, run indicator light, thermal overload protection and starting capacitor which can be connected directly to mains power. The box is also provided with auxiliary terminals for control probes, pressure switch or float switch.

**Enclosure Class:** IP68

**Voltage:** 1x240V

**Insulation Class:** F

**Speed:** 2900rpm

#### OPERATING CONDITIONS

**Pumped liquid:** Thin, clean, chemically non aggressive liquids with a maximum sand content 50g/m<sup>3</sup>.

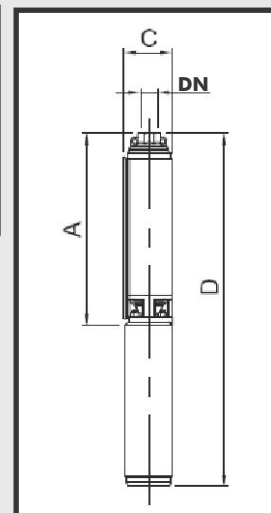
**Max. Water temperature:** +35°C

**Max. immersion depth:** 200m

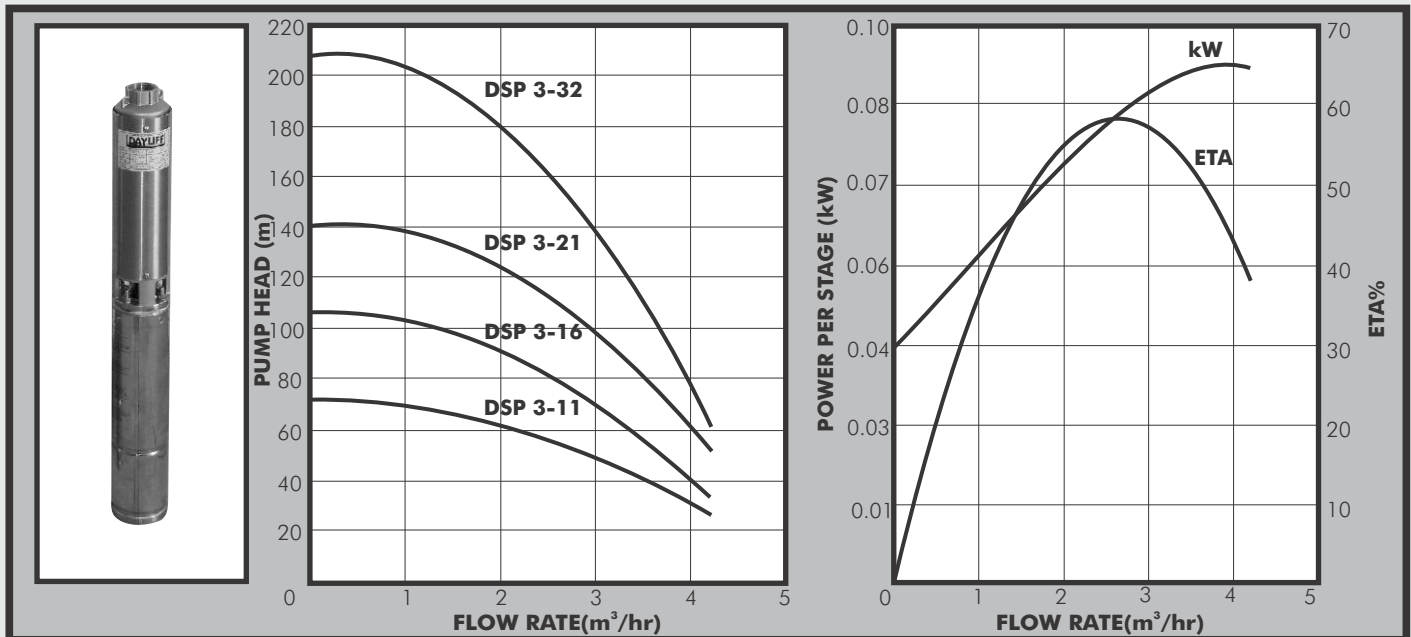
**Min. borehole diameter:** 110mm

#### PUMP DATA

Model	Power		Current (A)	$\frac{I_{stat}}{I}$	DN (")	Dimensions (mm)			Weight (kg)
	kW	HP				A	C	D	
DSP 1-10	0.37	0.5	3.3	3.2	1 1/4	330	98	676	10.6
DSP 1-15	0.55	0.75	4.3	2.8		420	98	785	12.5







#### PUMP

The DAYLIFF DSP range of submersible multistage centrifugal pumps are specially designed for borehole supply applications. Material of construction include noryl impellers, glass filled polycarbonate diffusers, stainless steel inlet and outlet chambers, stage casings, shaft and pump housing. These quality materials together with the floating type impeller design provide the pumps with efficient performance, excellent sand handling capabilities and long life.

#### MOTOR

The pump is coupled to a two pole sealed motor constructed principally from stainless steel. Single phase motors are supplied with a separate control unit that incorporates an isolator, run indicator light, thermal overload protection and starting capacitor which can be connected directly to the mains power. The box is also provided with auxiliary terminals for control probes, pressure switch or float switch. Three phase motors require a remote DOL starter; a DAYLIFF electronic pump controller is recommended for comprehensive pump control including wireless low level protection, motor overload and voltage fluctuation.

**Enclosure Class:** IP68

**Insulation Class:** F

**Speed:** 2900rpm

#### OPERATING CONDITIONS

**Pumped liquid:** Thin, clean, chemically non aggressive liquids with a max. sand content of 50g/m³.

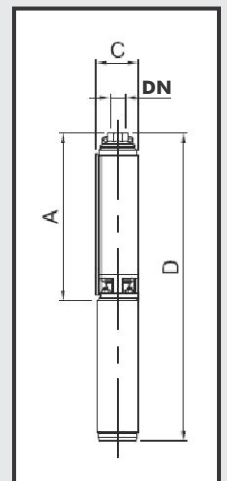
**Max. Water temperature:** +35°C

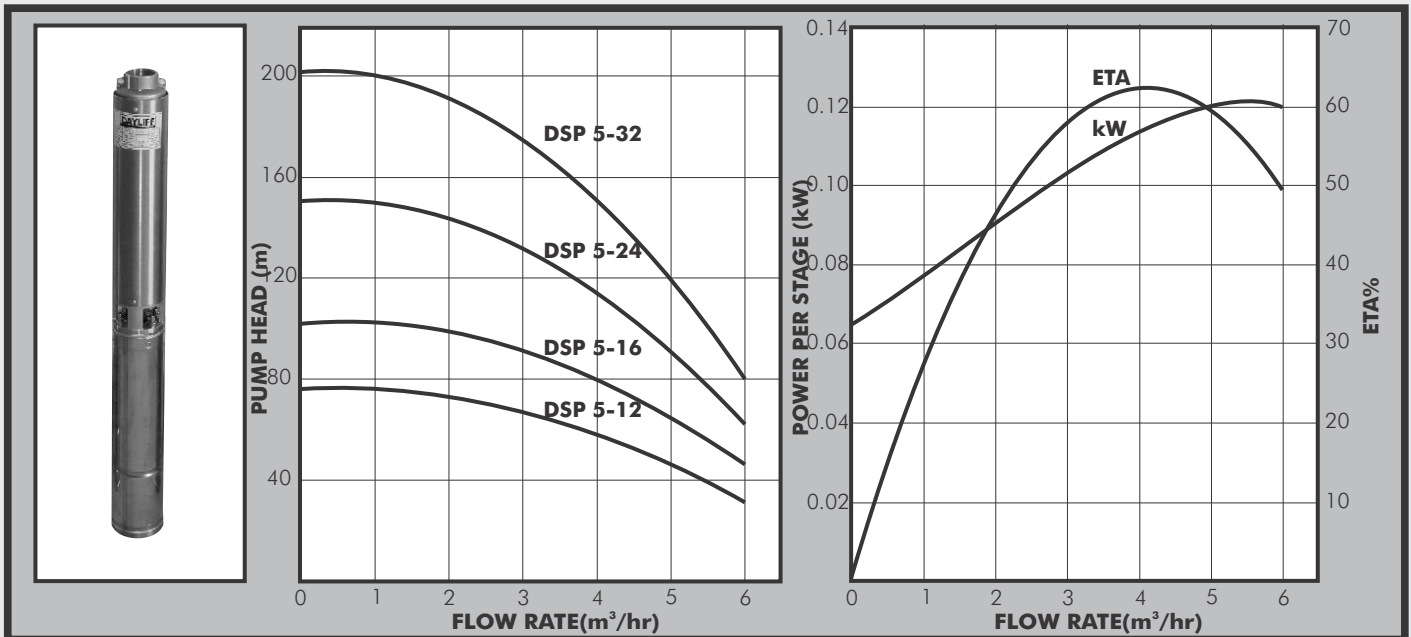
**Max. immersion depth:** 200m

**Min. borehole diameter:** 110mm

#### PUMP DATA

Model	Voltage (V)	Power		Current (A)	Istat I	DN (")	Dimensions (mm)			Weight (kg)
		kW	HP				A	C	D	
DSP 3-11	1x240	0.75	1	4.3	4.7	1¼	342	98	722	21
	3x415			2.3	3.9				707	20
DSP 3-16	1x240	1.1	1.5	8.1	4.0		430		835	24
	3x415			3.1	3.9				810	22
DSP 3-21	1x240	1.5	2	10.4	3.7		519		959	28
	3x415			4	3.5				924	25
DSP 3-32	1x240	2.2	3	15	3.1		749		1244	35
	3x415			5.6	3.9				1189	30





#### PUMP

The DAYLIFF DSP range of submersible multistage centrifugal pumps are specially designed for borehole supply applications. Material of construction include noryl impellers, glass filled polycarbonate diffusers, stainless steel inlet and outlet chambers, stage casings, shaft and pump housing. These quality materials together with the floating type impeller design provide the pumps with efficient performance, excellent sand handling capabilities and long life.

#### MOTOR

The pump is coupled to a two pole sealed motor constructed principally from stainless steel. Single phase motors are supplied with a separate control unit that incorporates an isolator, run indicator light, thermal overload protection and starting capacitor which can be connected directly to the mains power. The box is also provided with auxiliary terminals for control probes, pressure switch or float switch. Three phase motors require a remote DOL starter; a DAYLIFF electronic pump controller is recommended for comprehensive pump control including wireless low level protection, motor overload and voltage fluctuation.

**Enclosure Class:** IP68

**Insulation Class:** F

**Speed:** 2900rpm

#### OPERATING CONDITIONS

**Pumped liquid:** Thin, clean, chemically non aggressive liquids with a max. sand content of 50g/m³.

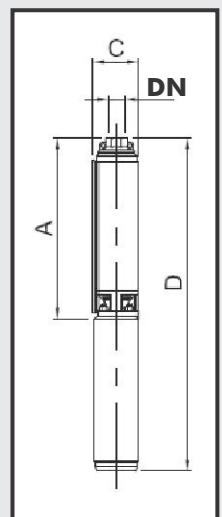
**Max. Water temperature:** +35°C

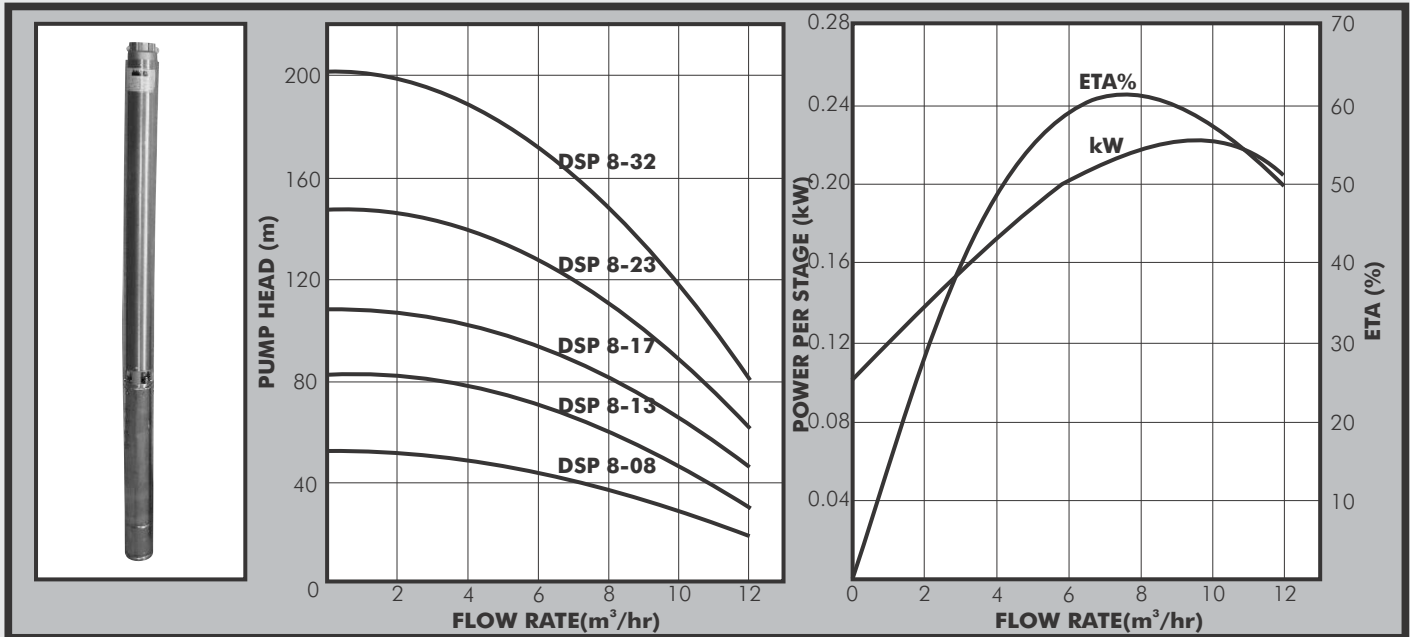
**Max. immersion depth:** 200m

**Min. borehole diameter:** 110mm

#### PUMP DATA

Model	Voltage (V)	Power		Current (A)	Istat	DN (")	Dimensions (mm)			Weight (kg)
		kW	HP		I		A	C	D	
DSP 5-12	1x240	1.1	1.5	8.1	4.0	1½	433	98	838	24
	3x415			3.1	3.9				813	22
DSP 5-16	1x240	1.5	2	10.4	3.7		542		982	28
	3x415			4	3.5				947	25
DSP 5-24	1x240	2.2	3	15	3.1		777		1272	35
	3x415			5.6	3.9				1217	30
DSP 5-32	3x415	3	4	7.4	5.8		1003		1481	39





#### PUMP

The DAYLIFF DSP range of submersible multistage centrifugal pumps are specially designed for borehole supply applications. Material of construction include noryl impellers, glass filled polycarbonate diffusers, stainless steel inlet and outlet chambers, stage casings, shaft and pump housing. These quality materials together with the floating type impeller design provide the pumps with efficient performance, excellent sand handling capabilities and long life.

#### MOTOR

The pump is coupled to a two pole sealed motor constructed principally from stainless steel. Single phase motors are supplied with a separate control unit that incorporates an isolator, run indicator light, thermal overload protection and starting capacitor which can be connected directly to the mains power. The box is also provided with auxiliary terminals for control probes, pressure switch or float switch. Three phase motors require a remote DOL starter; a DAYLIFF electronic pump controller is recommended for comprehensive pump control including wireless low level protection, motor overload and voltage fluctuation.

**Enclosure Class:** IP68

**Insulation Class:** F

**Speed:** 2900rpm

#### OPERATING CONDITIONS

**Pumped liquid:** Thin, clean, chemically non aggressive liquids with a max. sand content of 50g/m³.

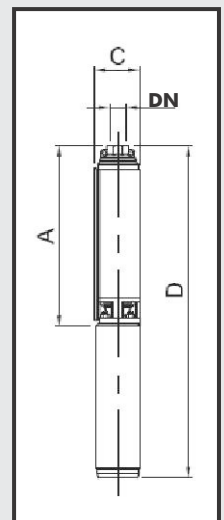
**Max. Water temperature:** +35°C

**Max. immersion depth:** 200m

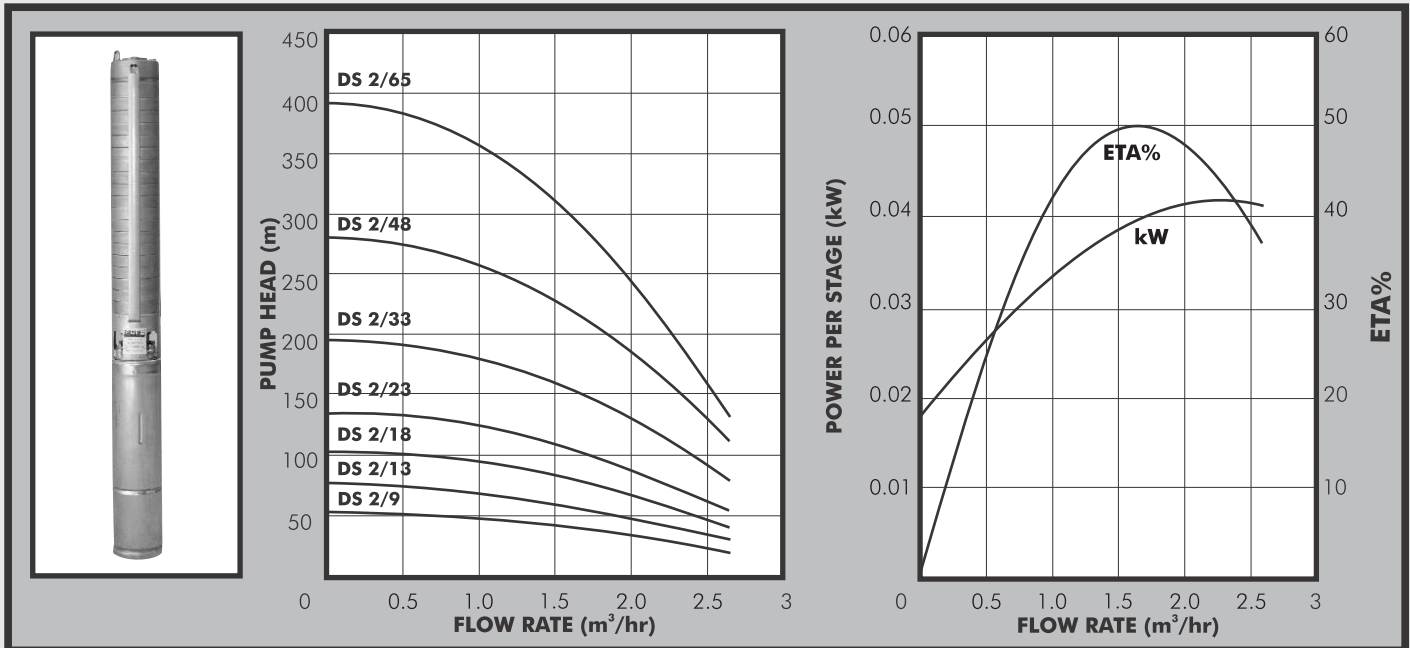
**Min. borehole diameter:** 110mm

#### PUMP DATA

Model	Voltage (V)	Power		Current (A)	Istat I	DN (")	Dimensions (mm)			Weight (kg)
		kW	HP				A	C	D	
DSP 8-08	1x240	1.5	2	10.4	3.7	2	418	98	858	27
	3x415			4	3.5				823	24
DSP 8-13	1x240	2.2	3	15	3.1				1068	34
	3x415			5.6	3.9				1013	29
DSP 8-17	3x415	3	4	7.4	5.8				1213	37
DSP 8-23	3x415	4	5.5	9.8	5.0				1528	47
DSP 8-32	3x415	5.5	7.5	13.7	4.7				1921	57







#### PUMP

DAYLIFF DS submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

#### MOTOR

The pump is coupled to a sealed liquid cooled oil filled 2-pole asynchronous squirrel-cage motor constructed of stainless steel. Single phase motors are supplied complete with purpose designed control boxes, while three phase motors require a remote starter. A DAYLIFF Electronic Pump Controller is recommended for comprehensive pump control including wireless low level, motor overload and irregular power supply protection.

**Enclosure Class:** IP68

**Insulation Class:** F

**Speed:** 2900 rpm

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids without solid particles or fibres.

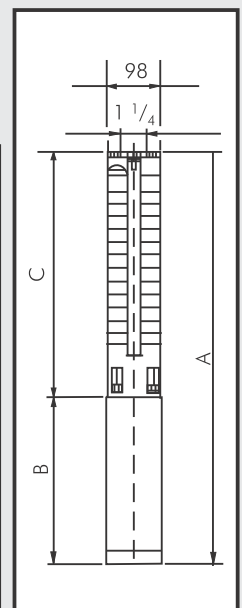
**Max Liquid Temperature:** +30°C.

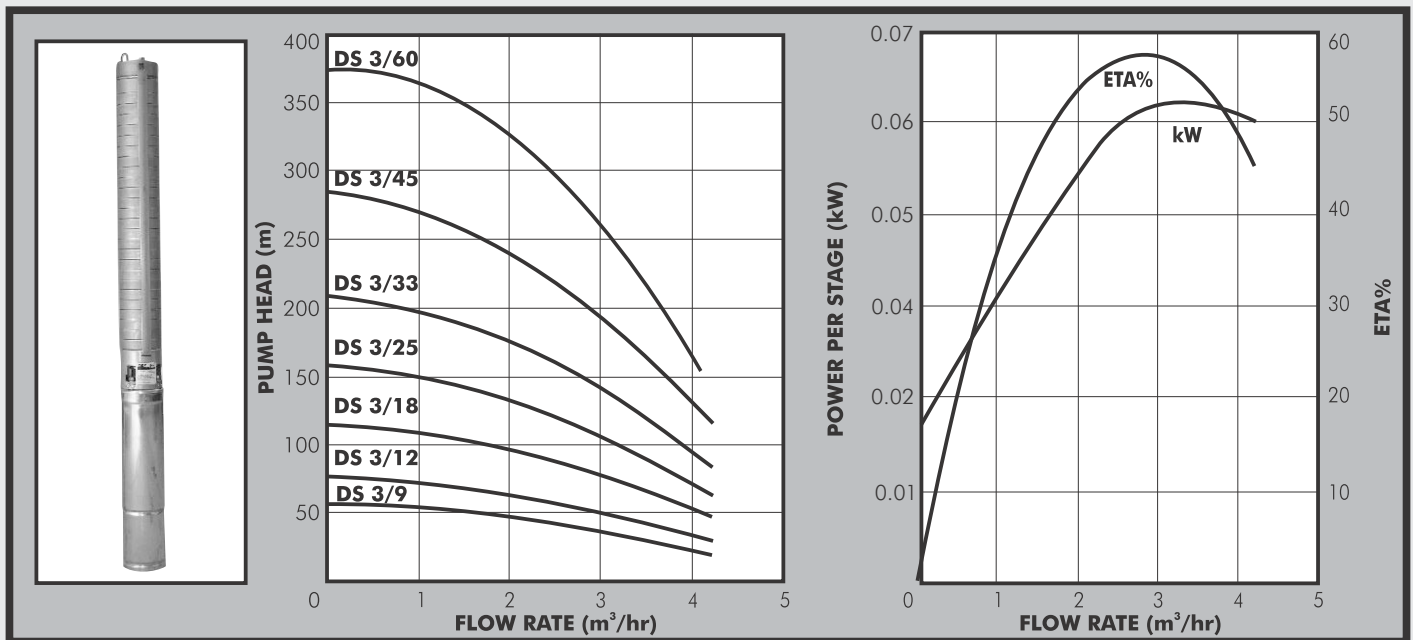
**Max Water Depth:** 200m

**Minimum Borehole Diameter:** 110mm

#### PUMP DATA

Model	Motor		Full Load Current (A)		Start Current (A)		Dimensions (mm)					Weight (kg)	
							C	B		A			
	kW	HP	1x240V	3x415V	1x240V	3x415 V		1x240V	3x415V	1x240V	3x415V	1x240V	3x415V
DS 2/9	0.37	0.5	3.5		9		356	325		681		9.5	
DS 2/13	0.55	0.75	4.3		15		440	365		805		12	
DS 2/18	0.75	1.0	6.3		20		545	375		920		13.4	
DS 2/23	1.1	1.5	8.5	3.6	25	16	650	395	375	1045	1025	15.3	14.4
DS 2/33	1.5	2.0	10.8	4.6	35	20	883	440	395	1323	1278	21.2	19.3
DS 2/48	2.2	3	14	6.3	45	33	1198	558	440	1756	1638	29.3	25
DS 2/65	3	4		7.9		45	1565		558		2123		41





#### PUMP

DAYLIFF DS submersible pumps are designed specially for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

#### MOTOR

The pump is coupled to a sealed liquid cooled 2-pole asynchronous squirrel-cage motor constructed of stainless steel. All single phase motors are supplied complete with purpose designed control boxes, while three phase motors require a remote starter. A DAYLIFF Electronic Pump Controller is recommended for comprehensive pump control including wireless low level, motor overload and irregular power supply protection. Note that due to the low starting torques of submersible motors it is recommended that DOL starters are used for all motor sizes.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900 rpm

#### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

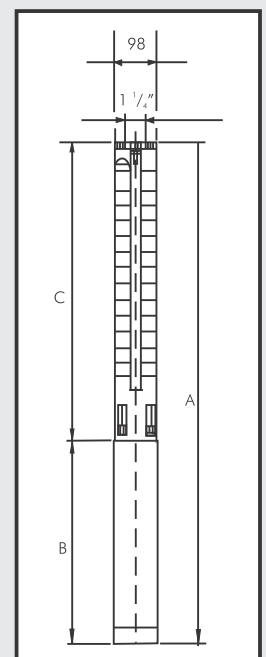
**Max. Liquid Temperature:** +30°C

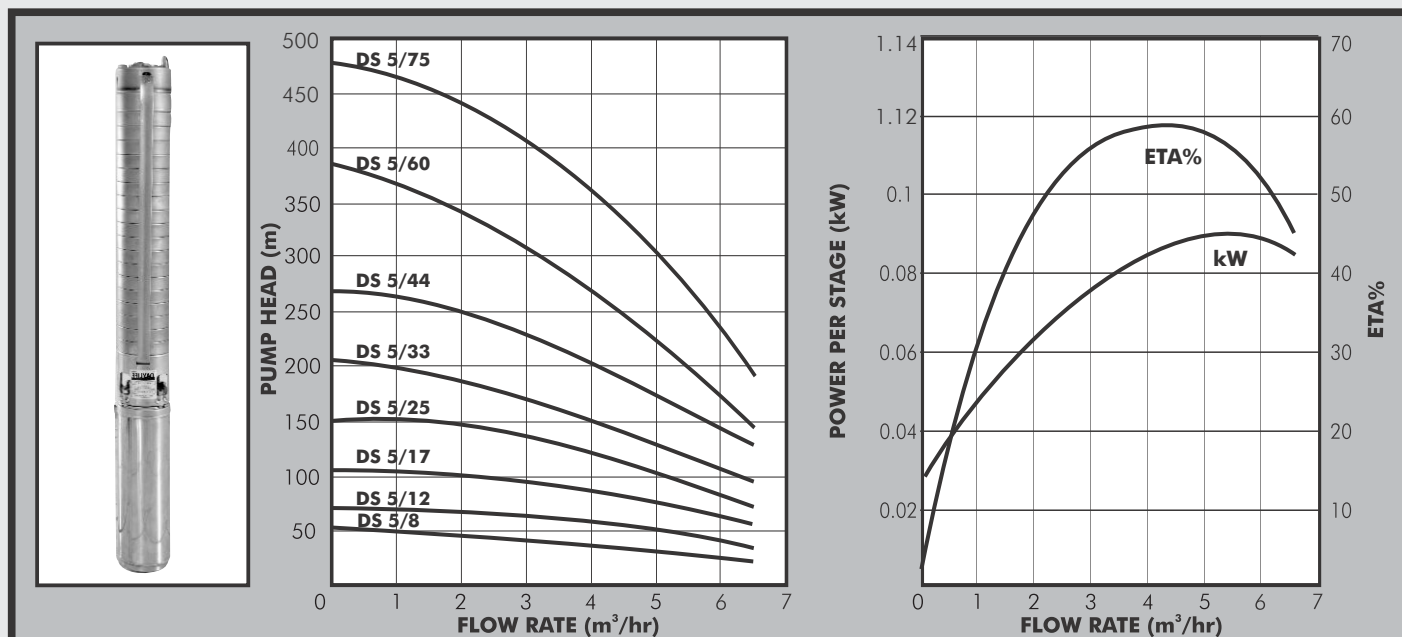
**Max. Water Depth:** 200m

**Min. Borehole Diameter:** 110mm

#### PUMP DATA

Model	Motor		Full Load Current (A)		Start Current (A)		Dimensions (mm)					Weight (kg)
	kW	HP	1x240V	3x415V	1x240V	3x415V	C	B		A		
DS 3/9	0.55	0.75	4.3		15		356	365		721		11.2
DS 3/12	0.75	1	6.3		20		419	375		794		12.3
DS 3/18	1.1	1.5	8.5	3.6	25	16	545	395	375	940	920	14.3
DS 3/25	1.5	2	10.8	4.6	35	20	692	440	395	1132	1087	17.6
DS 3/33	2.2	3	14	6.3	45	33	883	558	440	1441	1323	25.5
DS 3/45	3	4		7.9		45	1135		558		1693	30.3
DS 3/60	4	5.5		10.2		55	1460		614		2033	43





#### PUMP

DAYLIFF DS submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

#### MOTOR

The pump is coupled to a sealed liquid cooled oil filled 2-pole asynchronous squirrel-cage motor constructed of stainless steel. Single phase motors are supplied complete with purpose designed control boxes, while three phase motors require a remote starter. A DAYLIFF Electronic Pump Controller is recommended for comprehensive pump control including wireless low level, motor overload and irregular power supply protection.

**Enclosure Class:** IP68

**Insulation Class:** F

**Speed:** 2900 rpm

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids without solid particles or fibres.

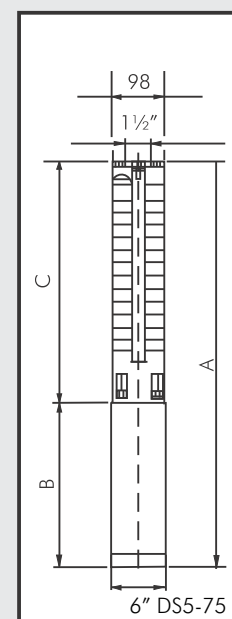
**Max Liquid Temperature:** +30°C.

**Max Water Depth:** 200m

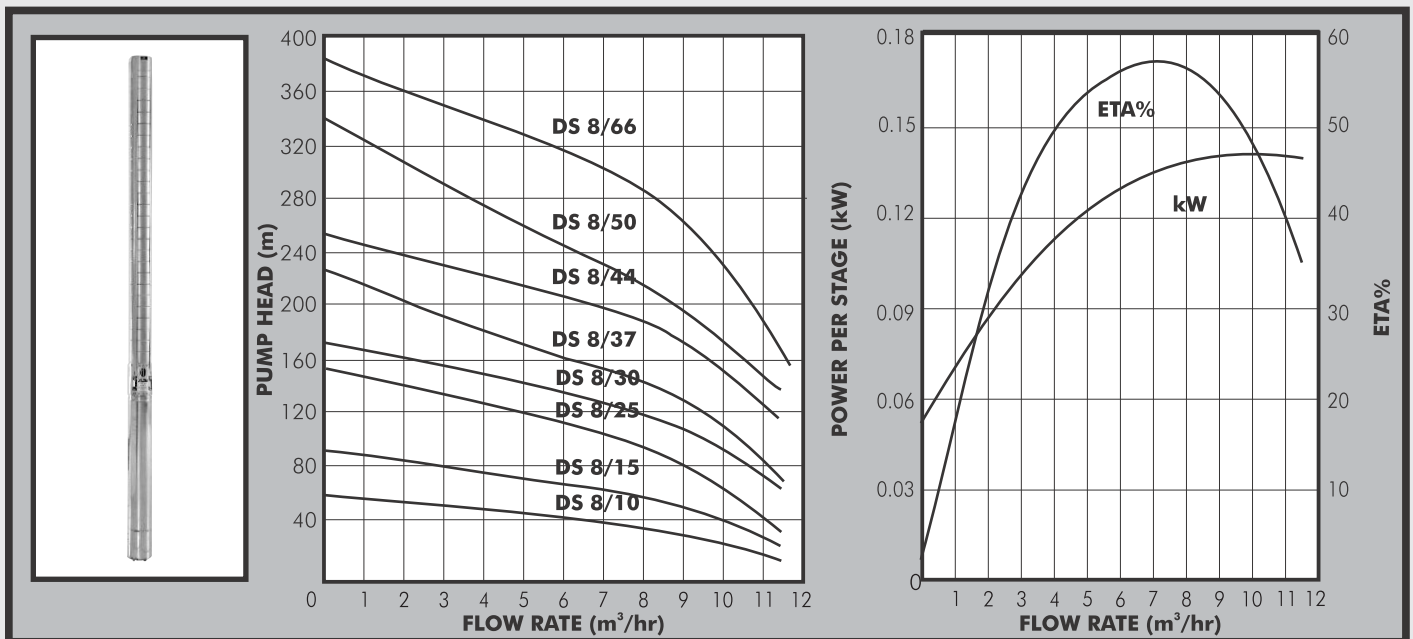
**Minimum Borehole Diameter:** 110mm - 4" motor, 260mm-6" motor (DS5/75 only)

#### PUMP DATA

Model	Motor		Full Load Current (A)		Start Current (A)		Dimensions (mm)					Weight (kg)
	kW	HP	1x240V	3x415V	1x240V	3x415V	C	B		A		
								1x240V	3x415V	1x240V	3x415V	
DS 5/8	0.75	1.0	6.3		20		335	375		710		11.5
DS 5/12	1.1	1.5	8.5	3.6	25	16	419	395	375	814	794	13.2
DS 5/17	1.5	2.0	10.8	4.6	35	20	524	440	395	964	919	16
DS 5/25	2.2	3.0	14	6.3	45	33	692	558	440	1250	1132	21.8
DS 5/33	3.0	4.0		7.9		45	868		558		1426	27.2
DS 5/44	4.0	5.5		10.2		55	1099		614		1713	35.4
DS 5/60	5.5	7.5		13.1		70	1460		684		2144	60
DS 5/75	7.5	10		16.5		84	2171		764		2935	69







#### PUMP

DAYLIFF DS pumps are designed for a wide range of uses with a particular application to borehole supply. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

#### MOTOR

The pump is coupled to a sealed liquid cooled 2-pole asynchronous squirrel-cage motor constructed of stainless steel. All single phase motors are supplied complete with purpose designed control boxes, while Three phase motors require a remote starter. A DAYLIFF Electronic Pump Controller is recommended for comprehensive pump control including wireless low level, motor overload and irregular power supply protection. Note that due to the low starting torques of submersible motors it is recommended that DOL starters are used for all motor sizes.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900 rpm

#### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

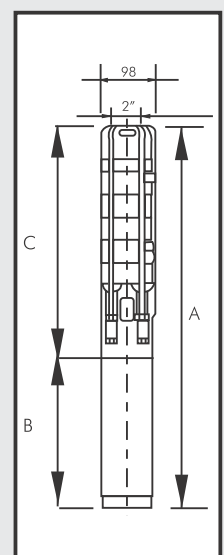
**Max. Liquid Temperature:** +30°C

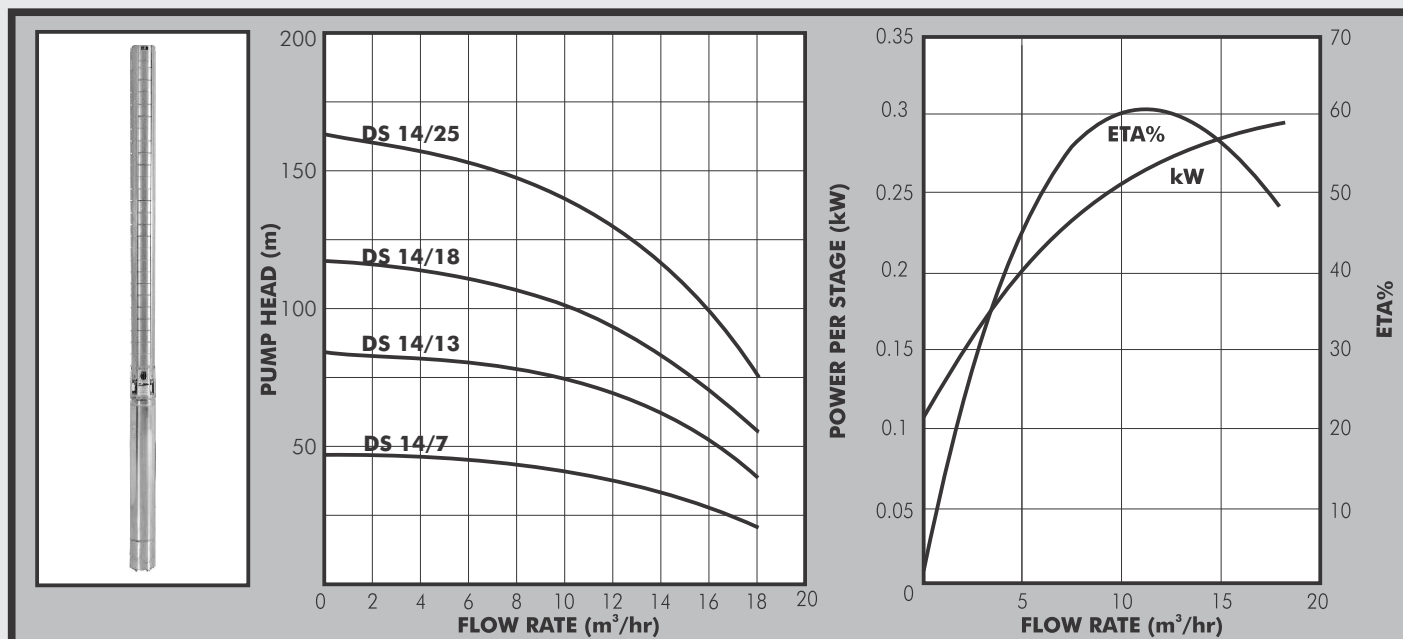
**Max. Water Depth:** 200m

**Min. Borehole Diameter:** 104mm - 4"  
150mm - 6"

#### PUMP DATA

Model	Motor Dia	Motor		Full Load Current (A)		Start Current (A)		Dimensions (mm)					Weight (kg)	
								A		B		C		
		kW	HP	1X240V	3X415V	1X240V	3X415V	1X240V	3X415V	1X240V	3X415V			
DS 8/10	4	1.5	2.0	11	4.4	41	19	1015	970	393	348	622	20	27
DS 8/15	4	2.2	3.0	16	5.9	50	26	1245	1225	413	393	832	23	34
DS 8/25	4	4.0	5.5		10		56		1866		614	1252		64
DS 8/30	4	5.5	7.5		14		70		2160		698	1462		68
DS 8/37	4	5.5	7.5		14		70		2437		684	1753		74
DS 8/44	4	7.5	10		17.4		84		2848		778	2070		84
DS 8/50	4	7.5	10		17.4		84		3067		764	2303		88
DS 8/66	6	11	15		26		125		4130		730	3400		120





#### PUMP

DAYLIFF DS submersible pumps are designed specially for borehole applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

#### MOTOR

The pump is coupled to a sealed liquid cooled oil filled 2-pole asynchronous squirrel-cage motor constructed of stainless steel. All single phase motors are supplied complete with purpose designed control boxes, while three phase motors require a remote starter. A DAYLIFF Electronic Pump Controller is recommended for comprehensive pump control including wireless low level, motor overload and irregular power supply protection. Note that due to the low starting torques of submersible motors it is recommended that DOL starters are used for all motor sizes.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900 rpm

#### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

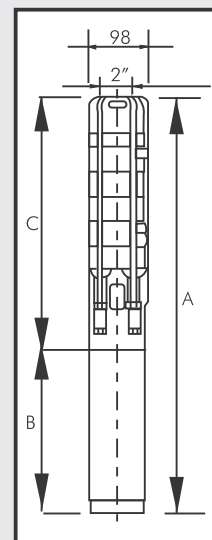
**Max. Liquid Temperature:** +30°C

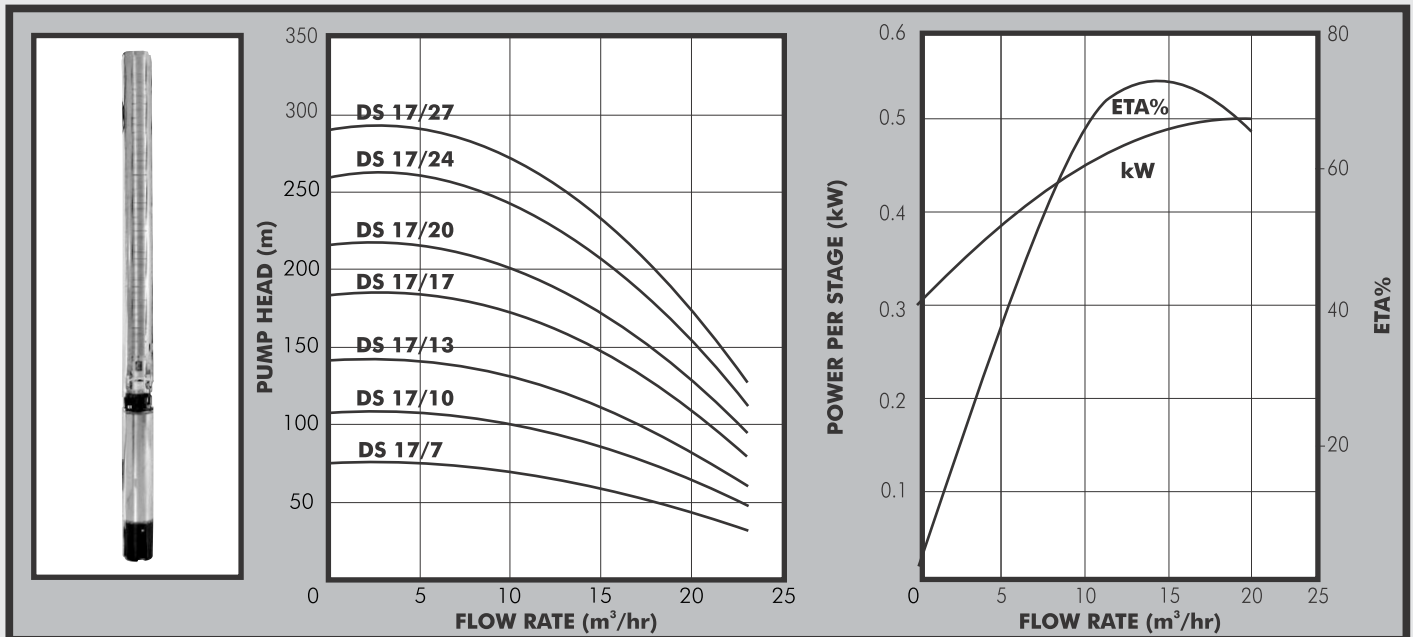
**Max. Water Depth:** 200m

**Min. Borehole Diameter:** 110mm

#### PUMP DATA

Model	Motor		Full Load Current (A)		Start Current (A)		Dimensions (mm)					Weight (kg)
							A		B		C	
	kW	HP	1X240V	3X415V	1X240V	3X415V	1X240V	3X415V				
DS 14/7	2.2	3	14	6.3	45	33	1193	1075	558	440	635	22
DS 14/13	4	5.5		10.2		55		1639		614	1025	33
DS 14/18	5.5	7.5		13.1		70		2034		684	1350	40
DS 14/25	7.5	10		16.9		84		2569		764	1805	48





#### PUMP

DAYLIFF DS submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

#### MOTOR

The pump is coupled to a sealed liquid cooled 2-pole asynchronous squirrel cage motor constructed from stainless steel. The motor requires a remote starter and if unstable supply voltage is likely, an additional quick tripping control relay is recommended. Note that due to low starting torques of submersible motors, it is recommended that DOL starters are used.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900rpm

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +30°C

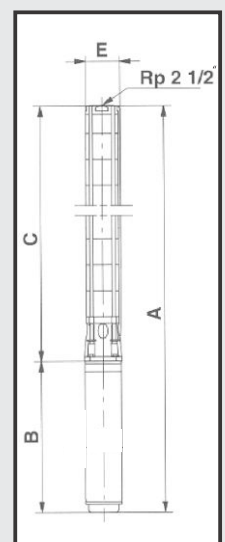
**Max. Water Depth:** 200m

**Min. Borehole Diameter:** 150 mm

#### PUMP DATA

Model	Motor		Full Load Current (A)	I <sub>start</sub> I	Dimensions (mm)				Weight (kg)
	kW	HP			A	B	C	E*	
DS 17-7	4	5.5	10.2	5.4	1320	614	706	131	36.7
DS 17-10	5.5	7.5	13.1	5.3	1571	684	887	131	44.6
DS 17-13	7.5	10	16.9	5.0	1833	764	1069	142	53
DS 17-17	9.2	12.5	22.8	4.2	1996	685	1311	142	77.2
DS 17-20	11	15	26	4.8	2222	730	1492	142	85.5
DS 17-24	15	20	34.2	5.0	2519	785	1734	142	97.3
DS 17-27	15	20	34.2	5.0	2701	785	1916	142	101.7

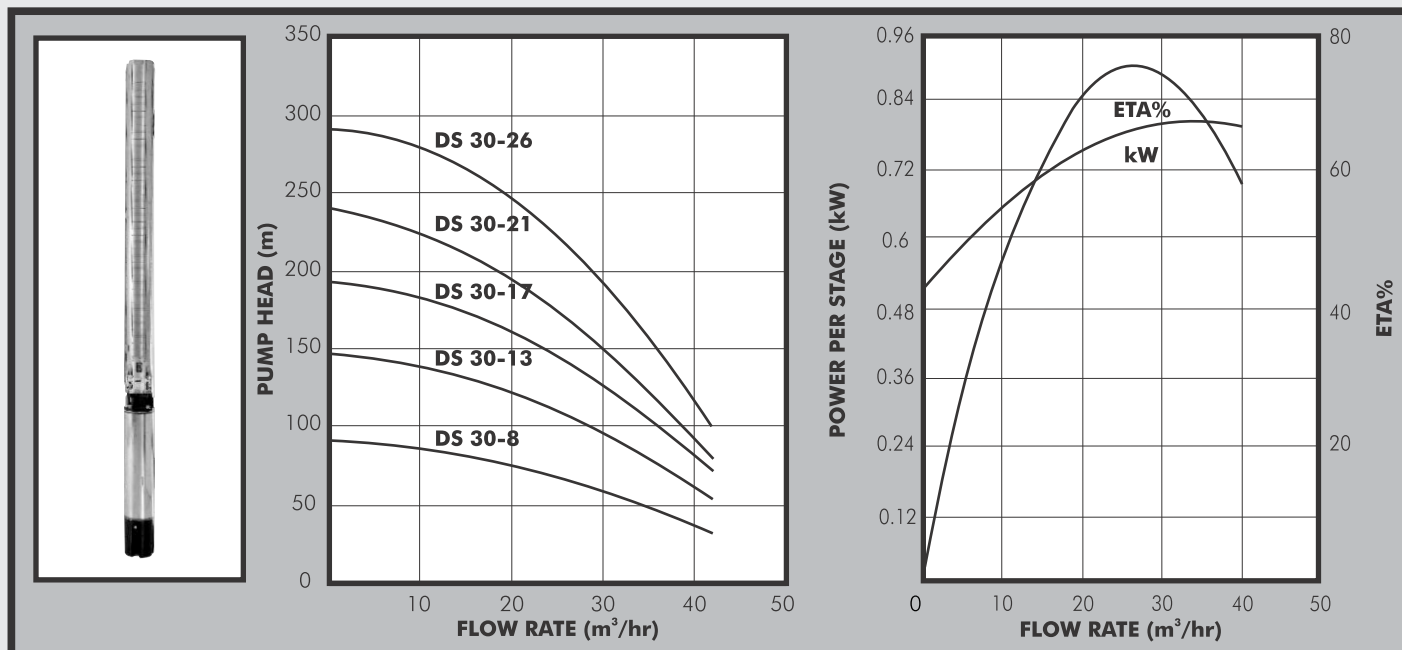
\*E=Maximum diameter of the pump with one motor cable





# DS 30

## Multistage Centrifugal Borehole Pumps



### PUMP

DAYLIFF DS borehole pumps are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

### MOTOR

The pump is coupled to a 2-pole asynchronous sealed liquid cooled motor constructed stainless steel. The motor requires a remote starter and if unstable supply voltage is likely, an additional quick tripling control relay is recommended. Note that due to low starting torques of submersible motors, it is recommended that DOL starters are used.

**Enclosure Class:** IP68

**Insulation Class:** F

**Speed:** 2900rpm

### OPERATING CONDITIONS

**Pumped liquid:** Thin, chemically non-aggressive without solid particles or fibres

**Max. Liquid Temperature:** +30°C

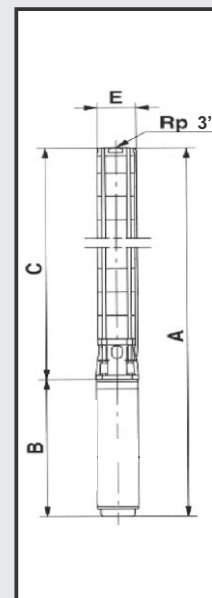
**Max. Water Depth:** 300m

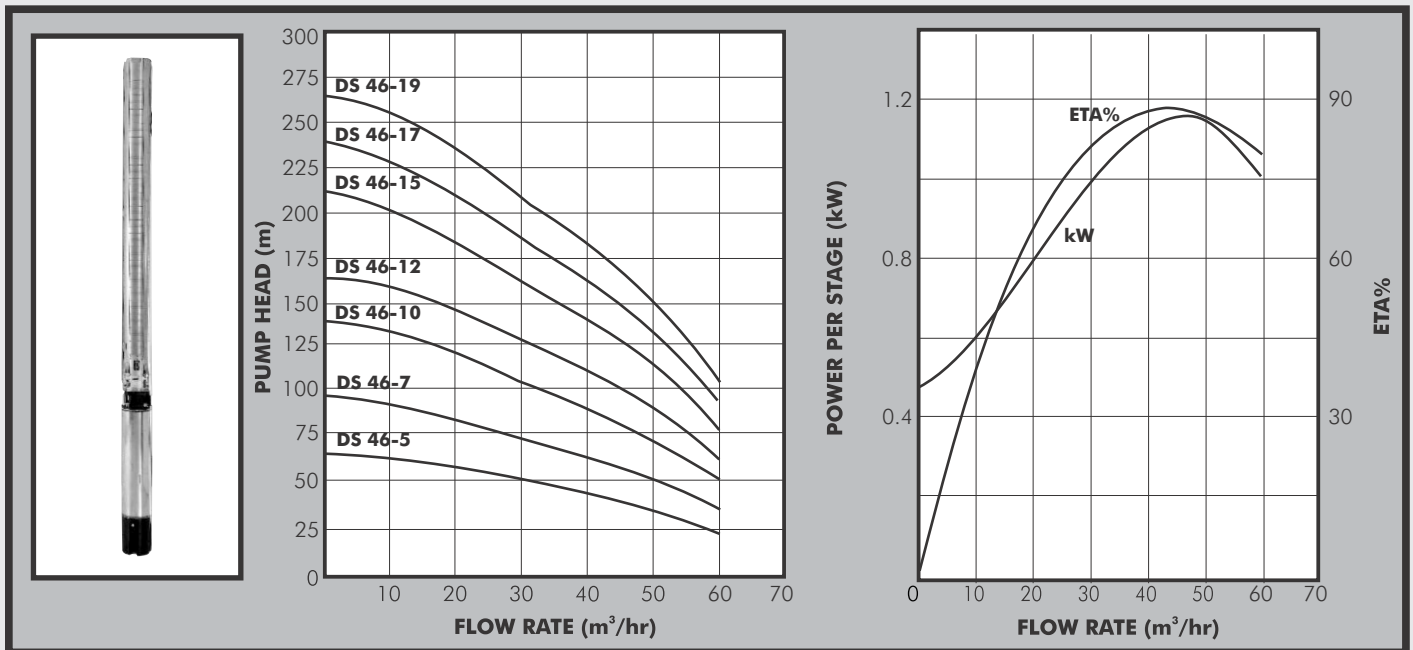
**Min. Borehole Diameter:** 200mm

### PUMP DATA

Model	Motor Size		Full Load Current (A)	I start I	Dimensions (mm)				Weight (kg)
	kW	HP			A	B	C	E*	
DS 30-8	7.5	10	16.5	5	1816	778	1038	142	49
DS 30-13	11	15	25.5	4.4	2248	730	1518	142	80
DS 30-17	15	20	33.4	4.8	2687	785	1902	142	93
DS 30-21	18.5	25	41	5.2	3146	860	2286	142	107
DS 30-26	22	30	47	5.1	3686	920	2766	142	122

\*E=Maximum diameter of the pump with one motor cable





#### PUMP

DAYLIFF DS submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

#### MOTOR

The pump is coupled to a sealed liquid cooled 2-pole asynchronous squirrel-cage motor constructed from stainless steel. The motor requires a remote starter and if unstable supply voltage is likely, an additional quick tripping control relay is recommended. Note that due to low starting torques of submersible motors, it is recommended that DOL starters are used.

**Enclosure Class :** IP68

**Insulation Class:** F

**Volatge:** 3x415V

**Speed:** 2900rpm

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +30°C

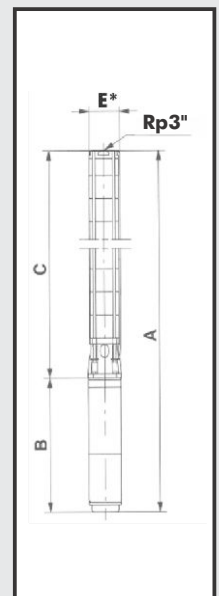
**Max. Water Depth:** 300m

**Min. Borehole Diameter:** 200mm

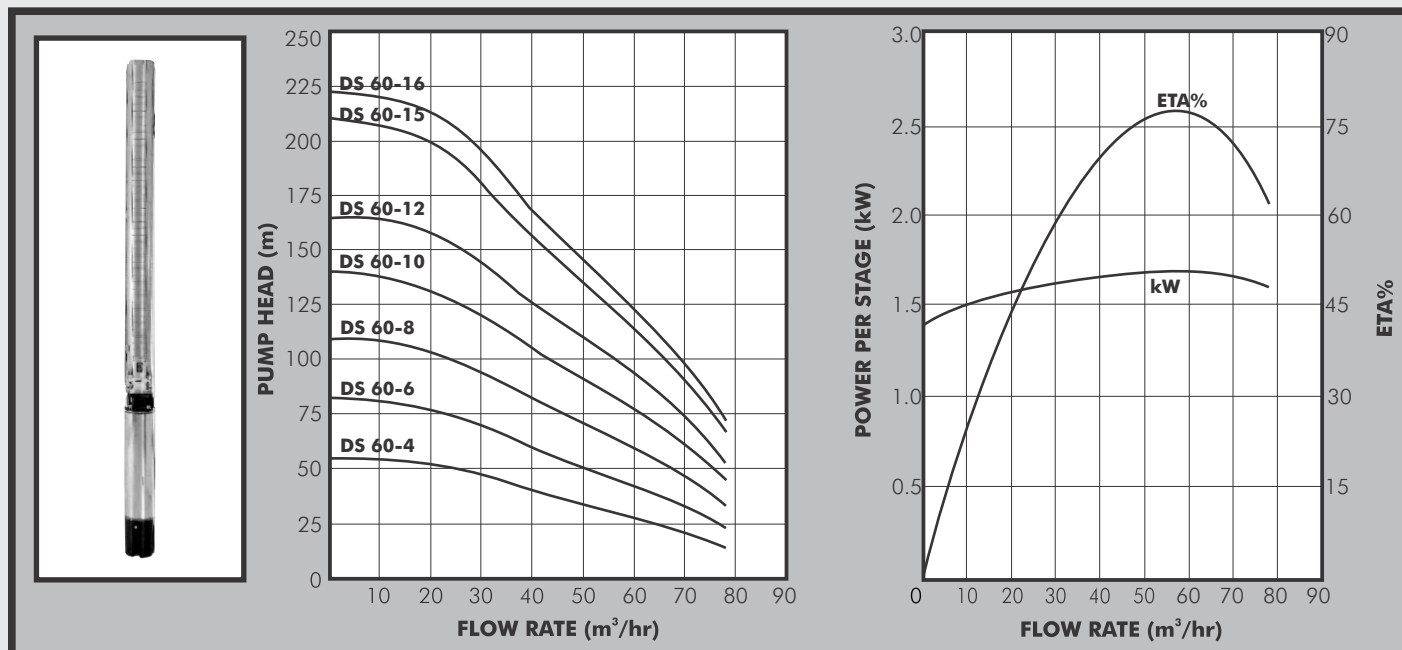
#### PUMP DATA

Model	Motor		Full Load Current (A)	I start I	Dimensions (mm)				Weight (kg)
	kW	HP			A	B	C	E*	
DS 46-5	7.5	10	18.3	4.4	1495	660	835	149	62
DS 46-7	11	15	26	4.8	1791	730	1061	149	74
DS 46-10	15	20	34.2	5.0	2185	785	1400	149	86
DS 46-12	19	25	42	5.5	2486	860	1626	149	99
DS 46-15	22	30	47.5	5.4	2885	920	1965	149	111
DS 46-17	26	35	56	4.9	3100	1157	2191	149	120
DS 46-19	30	40	63.5	4.7	3467	1050	2417	149	133

E\* = Maximum diameter of the pump inclusive of cable guard and motor







#### PUMP

DAYLIFF DS submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

#### MOTOR

The pump is coupled to a sealed liquid cooled 2-pole asynchronous squirrel-cage motor constructed from stainless steel. The motor requires a remote starter and if unstable supply voltage is likely, an additional quick tripping control relay is recommended. Note that due to low starting torques of submersible motors, it is recommended that DOL starters are used.

**Enclosure Class :** IP68

**Insulation Class:** F

**Voltage:** 3x415V

**Speed:** 2900rpm

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +30°C

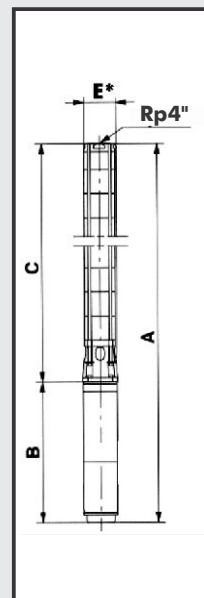
**Max. Water Depth:** 300m

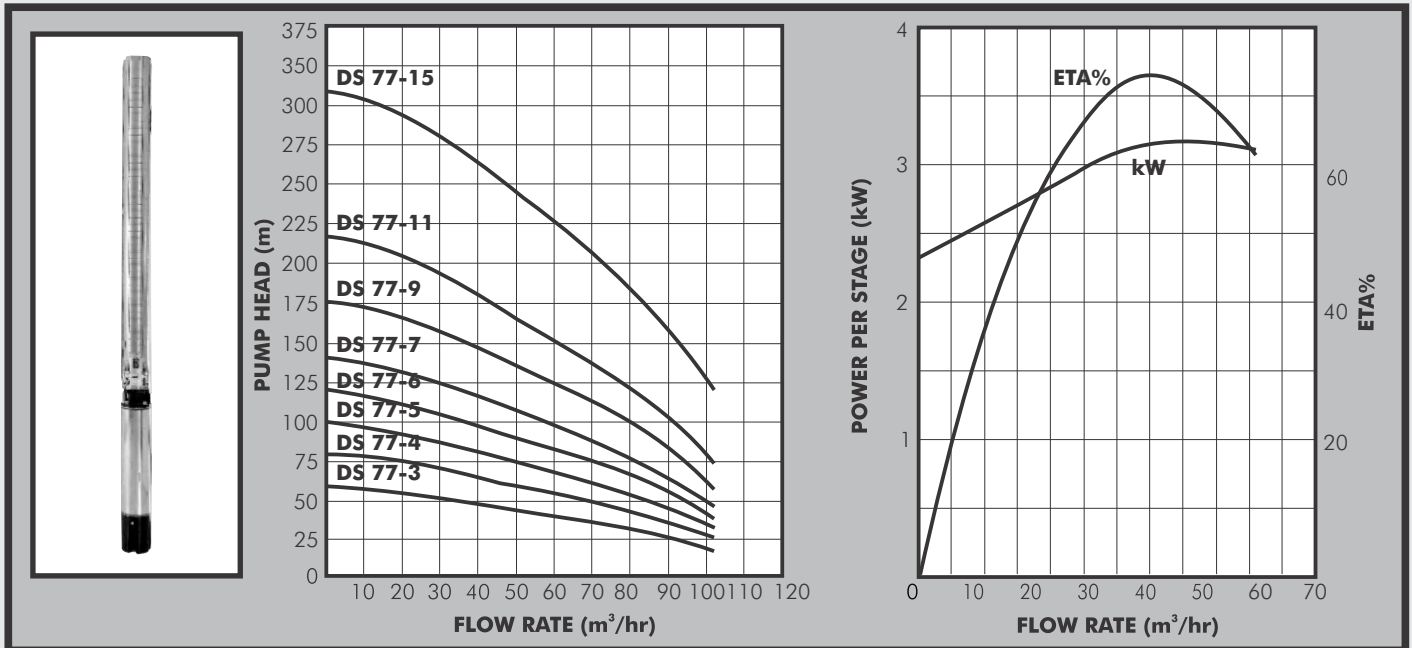
**Min. Borehole Diameter:** 200mm

#### PUMP DATA

Model	Motor		Full Load Current (A)	I start I	Dimensions (mm)				Weight (Kg)
	kW	HP			A	B	C	E*	
DS 60-4	7.5	10	16.9	5.0	1382	660	722	149	44
DS 60-6	11	15	26	4.8	1678	730	948	149	71
DS 60-8	15	20	34.2	5.0	1959	785	1174	149	82
DS 60-10	18.5	25	42	5.5	2260	860	1400	149	94
DS 60-12	22	30	47.5	5.4	2546	920	1626	149	105
DS 60-15	26	35	56	4.9	2800	1157	1965	149	175
DS 60-16	30	40	63.5	4.7	3128	1050	2078	149	126

E\*=Maximum diameter of the pump inclusive of cable guard and motor





#### PUMP

DAYLIFF DS submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

#### MOTOR

The pump is coupled to a sealed liquid cooled 2-pole asynchronous squirrel-cage motor constructed from stainless steel. The motor requires a remote starter and if unstable supply voltage is likely, an additional quick tripping control relay is recommended. Note that due to low starting torques of submersible motors, it is recommended that DOL starters are used.

**Enclosure Class :** IP68

**Insulation Class:** F

**Volatge:** 3x415V

**Speed:** 2900rpm

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +30°C

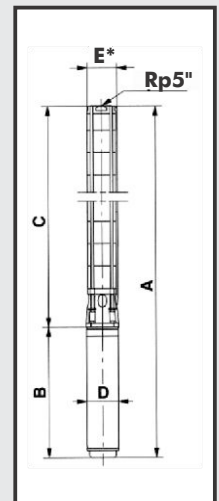
**Max. Water Depth:** 300m

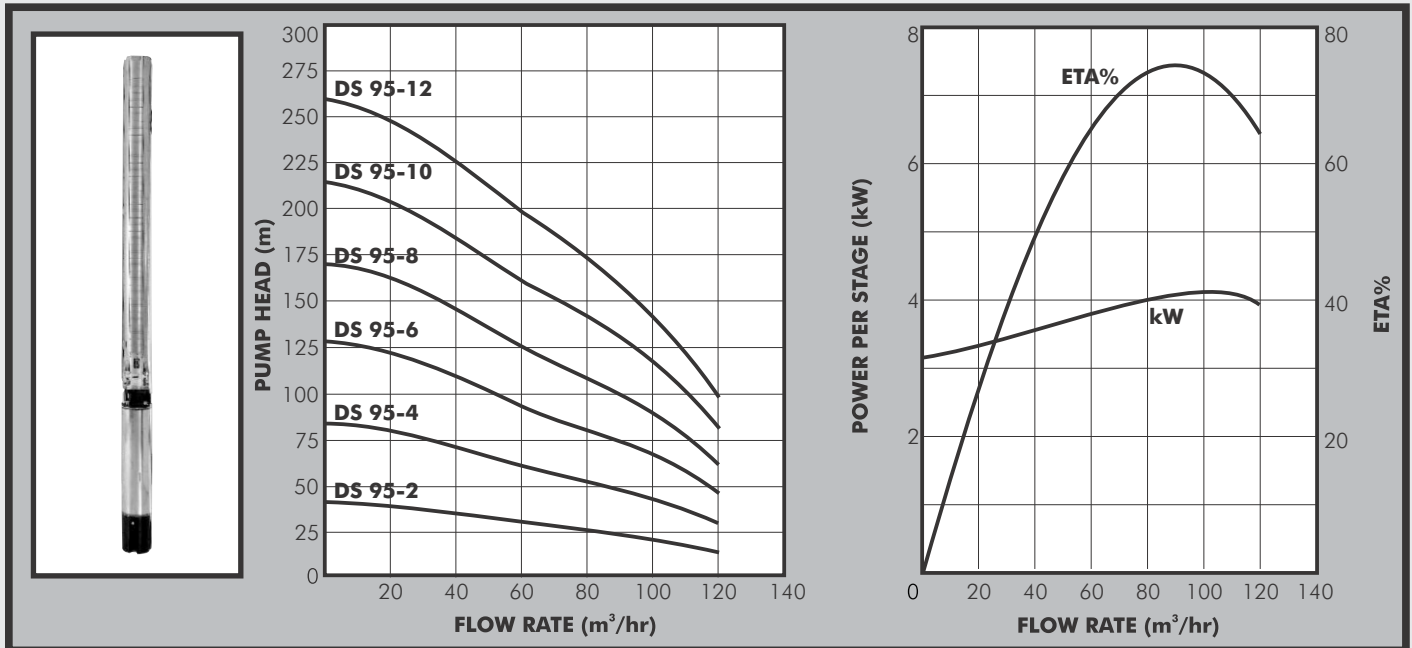
**Min. Borehole Diameter:** 200mm-6", 254mm-8"

#### PUMP DATA

Model	Motor Size (")	Motor		Full Load Current (A)	I start I	Dimensions (mm)				Weight (Kg)
		kW	HP			A	B	C	E*	
DS 77-3	6	11	15	27.5	3.7	1604	730	874	178	92
DS 77-4		15	20	36.5	4.2	1788	785	1003		113
DS 77-5		18.5	25	43.5	4.5	1991	860	1131		119
DS 77-6		22	30	51.5	5.5	2179	920	1259		138
DS 77-7		26	35	56.5	5.1	2500	1157	1387		181
DS 77-9		30	40	64	5.7	2694	1050	1644		200
DS 77-11		37	50	78.5	5.7	3080	1180	1900		217
DS 77-15	8	55	75	114	5.9	3400	1350	2424	200	269

E\*=Maximum diameter of the pump inclusive of cable guard and motor





#### PUMP

DAYLIFF DS submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

#### MOTOR

The pump is coupled to a sealed liquid cooled 2-pole asynchronous squirrelcage motor constructed from stainless steel. The motor requires a remote starter and if unstable supply voltage is likely, an additional quick tripping control relay is recommended. Note that due to low starting torques of submersible motors, it is recommended that DOL starters are used.

**Enclosure Class :** IP68

**Insulation Class:** F

**Voltage:** 3x415V

**Speed:** 2900rpm

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +30°C

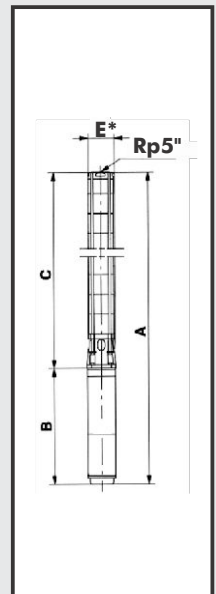
**Max. Water Depth:** 300m

**Min. Borehole Diameter:** 200mm - 6", 254mm - 8" motor

#### PUMP DATA

Model	Motor Size (")	Motor		Full Load Current (A)	I start I	Dimensions (mm)				Weight (Kg)
		kW	HP			A	B	C	E*	
DS 95-2	6	9.2	13	21.8	4.6	1631	867	746	178	84
DS 95-4		18.5	25	42	5.5	2060	1057	1003		115
DS 95-6		26	35	57	4.9	2416	1157	1259		177
DS 95-8		37	50	78.5	5.7	2827	1312	1515		206
DS 95-10	8	45	60	96.5	6.0	3053	1270	1783	200	234
DS 95-12		55	75	114	5.9	3389	1350	2039		258

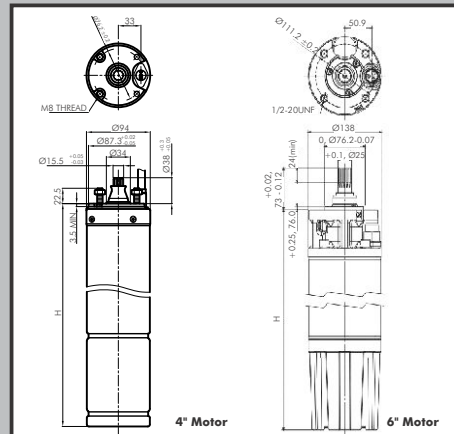
E\*=Maximum diameter of the pump inclusive of cable guard and motor





# DSM

## Submersible Motor



DAYLIFF DSM submersible motors are specifically designed to give exceptional reliability and efficiency in all borehole pumping applications. Features include:-

- 4" oil filled type motor with FDA approved colourless oil
- 6" canned type motor with resin filled stator for extended motor life
- Largely stainless steel AISI 304 construction with cast iron top and bottom bearings
- Water lubricated thrust and radial bearings
- Reinforced netted Nylon diaphragm for internal motor pressure compensation
- Thermal overload for motor protection
- Standard NEMA flanges for use with all types of pumps

**Protection:** IP68

**Insulation Class:** F

**Voltage:** 1x220V/240V, 50Hz / 3x380V/415V, 50Hz

### OPERATING PARAMETERS

**Max Voltage Variation:**  $\pm 10\%$

**Max Starts/Hr:** 20

**Max Water Temperature:** 35°C

**Min Water Pass Flow Rate:** 0.2m/sec

**Max Immersion Depth:** 200m-4" and 300m-6"

**Installation:** Vertical/horizontal with a tilt angle  $> 5^\circ$

### MOTOR DATA SINGLE PHASE

Power		In	Istart	Efficiency	PF	RPM	Capacitor	Tail Cable		H	Weight
kW	HP	(A)	(A)	%	CosØ		µF	mm²	m	(mm)	(Kg)
0.37	0.5	3.7	12	53	0.90	2840	16	1.5	1.7	346	7
0.55	0.75	5.0	15	62			20			365	8
0.75	1	6.2	20	64			25			380	9
1.1	1.5	8.1	32	68			35			405	10
1.5	2	10.4	38	73			40			440	12
2.2	3	15.0	46	72			55			495	14

### THREE PHASE

Power		In (A)	Istart (A)	Efficiency (%)	PF (CosØ)	RPM	Thrust Load (N)	Tail Cable		H (mm)	Dia (mm)	Weight (Kg)			
kW	HP							mm²	m						
0.37	0.5	1.6	4.5	60	0.80	2820	2000	1.5	1.7	330	94	7			
0.55	0.75	1.9	6.7	64		2840				346		7			
0.75	1	2.3	8.9	66		2850				365		8			
1.1	1.5	3.1	12	70						380		9			
1.5	2	4.0	14	72		2850				3000			405	10	
2.2	3	5.6	22	71									440	12	
3.0	4.0	7.4	43	73	0.85	2840	5000	2.0	2.5	516	140	15			
4.0	5.5	9.8	49	75		2850				607		20			
5.5	7.5	13.7	71	76						683		23			
7.5	10	18.9	96	76		2837				783		28			
5.5	7.5	12.7	59.5	79						627		51			
7.5	10	16.5	67.5	79		2826				662		55			
11	15	24.2	60.7	77	0.86	2802	15500	4.0	4.0	727		61			
15	20	32	142.3	80		2837				787		67			
18.5	25	40	101.2	81		2814				857		75			
22	30	47	139.4	77		2720				907		80			
30	40	64.1	320	83		2848				1047		102			
					0.89			6.0							
					0.84			8.4							

### MATERIAL SPECIFICATION

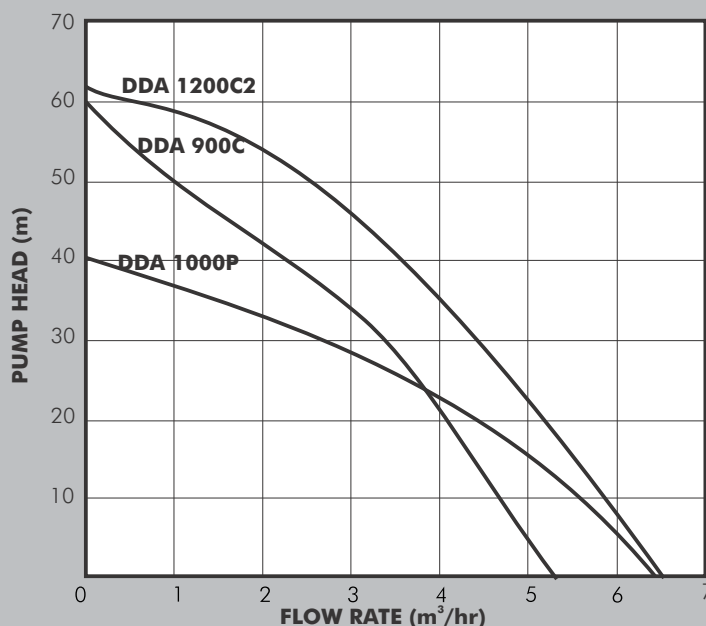
Component	Material
Motor shell	304 stainless steel
Sand guard	NBR
Cable connector	4"-EPDM, 6"-XLPE
Upper end bracket cover	4"-304 stainless steel, 6"-Cast Iron
Upper end bracket	Zinc plated cast iron
Mechanical Seal	Ceramic /Carbon
Shaft (0.5-10HP)	4"-304 stainless steel, 6"-AISI 420
Rotor (0.5-3HP)	4"-Aluminium
Rotor (4-10HP)	4"-Copper
Winding	Copper
Lower end bracket	4"-Aluminium, 6"-Cast Iron
Lower end bracket cover	4"-304 stainless steel, 6"-Cast Iron
Diaphragm	NBR



DDA 1000P

DDA 1200C

DDA 900C



### PUMP

DAYLIFF DDA submersible multistage centrifugal pumps are designed for pumping clean, non-aggressive water in various domestic and light duty applications. They are particularly suitable for wells and boreholes, though can also be used for water transfer from tanks, irrigation and pressure boosting applications as an alternative to a conventional dry mounted pump. A particular design feature is the jacketed motor arrangement which provides excellent cooling and allows the pump to work semi-submerged. The pumps' design features mechanical seals (twin on DDA1200C2) in an intermediate oil chamber for greater pump reliability and pump construction is Polypropylene impellers and diffusers and stainless steel pump casing.

Pumps can be fitted with a pressure controller for automatic operation. All pumps are supplied complete with 20m cable.

DDA1000P & DDA1200C2 are fitted with a low level float switch with adjustment clamp and an inbuilt capacitor for simplified installation and are particularly suitable to well and tank applications.

DDA900C is particularly suited to borehole applications and is supplied with an external control box which incorporates an isolator, run indicator light, thermal overload protection and starting capacitor which can be connected directly to mains power. The box is also provided with auxiliary terminals for control probes, pressure switch or float switch.

### MOTOR

Enclosed and rewindable liquid cooled, non-overloading induction motor designed for continuous operations incorporating a thermal cut-out in the windings to protect against overloading. Pumps can be connected directly to the mains power supply through a 10A fuse or MCB.

**Enclosure Class:** X8

**Insulation Class:** B

**Voltage:** 1x240V

**Speed:** 2900rpm

### OPERATING CONDITIONS

**Pumped Liquids:** Thin, chemically non aggressive liquids without solids or fibres

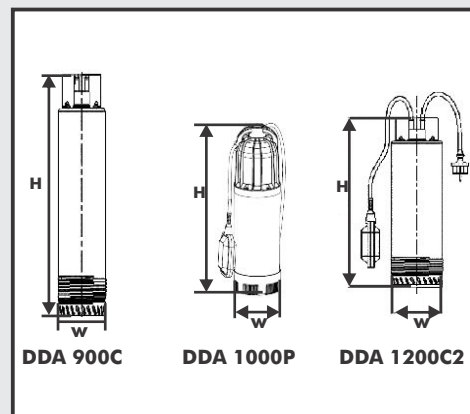
**Max. Liquid temperature:** 35°C

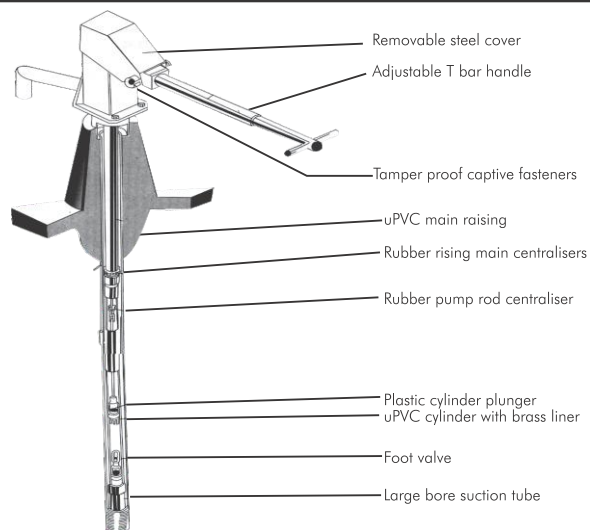
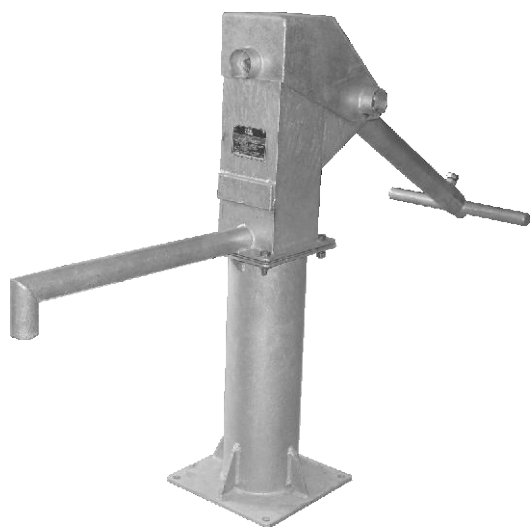
**Max. Immersion Depth:** DDA1000P - 6m; DDA1200C2 - 20m; DDA900C - 16m

**Max. Particle Size:** DDA1000P - 1.5mm; DDA900C & DDA1200C2 - 1.0mm

### PUMP DATA

Model	Power		Max. Current (A)	Outlet (")	Dimensions (mm)		Weight (kg)
	kW	HP			H	W	
DDA 900C	0.9	1.2	3.9	1	645	100	11
DDA 1000P	1.0	1.3	4		440	150	9.4
DDA 1200C	0.92	1.2	6.5		577	128	18





The Afridev reciprocating type hand pump has been specially designed by SKAT-HTN (Swiss Centre for Development Cooperation in Technology and Management) to meet the requirements for Village Level Operation and Maintenance (VLOM) as specified by the UNDP/World Bank. The pump has undergone extensive laboratory and field development tests and is one of only two designs which fulfils all aspects of the UNDP/World Bank specification at depths between 0 and 45m. Particular features are:

- Up to 1300 litres/hour output at pumping lifts up to 45m.
- Heavy duty design suitable for continuous operation over long periods.
- Rugged all galvanised steel construction for corrosion resistance and long life.
- Simple to instal, operate and maintain at the village level.
- Designed for ease of maintenance with basic tools and cheap, readily available spare parts.

Though the Afridev design is widely manufactured throughout the world, quality of the product itself is determined by that of the manufacturing process. The DAYLIFF Afridev is manufactured to exacting standards in a fully equipped ISO 9001:2000 certified factory with cumulative production experience of hundreds of thousands of units. The combination of this highest level of manufacturing quality, a tried and tested design and Davis & Shirliff's service commitment result in a rugged and dependable product ideal for all hand powered ground water pumping applications

### SPECIFICATION

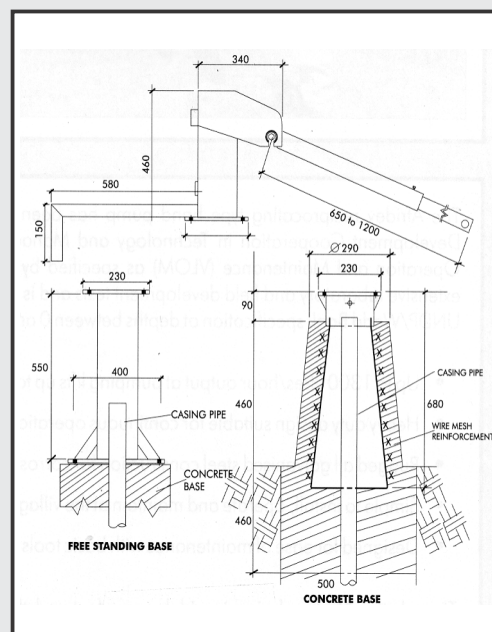
**Pump Head:** Fabricated throughout from mild steel hot dip galvanised for corrosion protection. Long life nylon bushes are provided for the handle fulcrum and rod hanger bearing.

**Pump Stand:** Option of free standing or concrete encased fabricated galvanised pump stand.

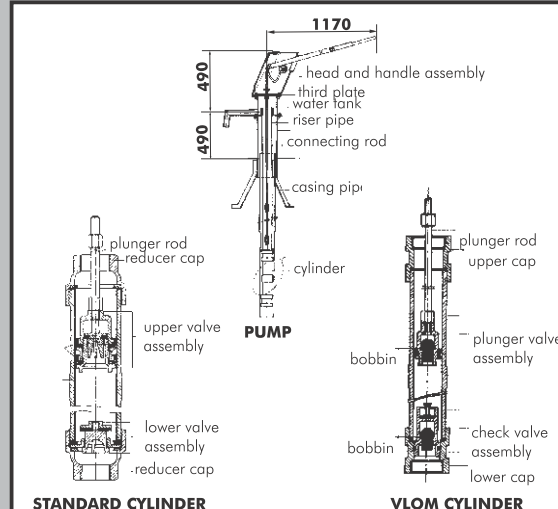
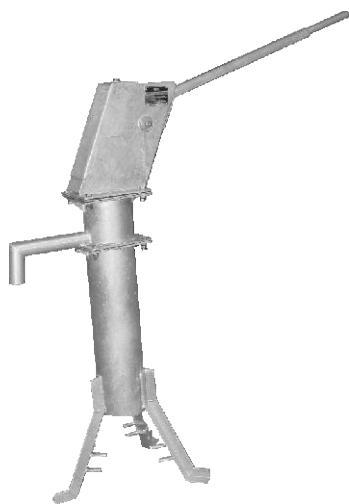
**Cylinder:** 50mm diameter single acting PVC cylinder with brass liner, plastic plunger and plastic foot valve. Displacement per stroke is 0.44 litres.

**Rising Main:** 63mm O/D PVC rising main provided as standard in 3m lengths.

**Pump Rods:** Option of 10mm galvanized mild steel or stainless steel rods in standard lengths of 3m. Connection arrangement is by hook and eye with the option of cast or fabricated connectors.







The 'India' range of positive displacement reciprocating cylinder type hand pumps are long established, robust products for general borehole and well applications. Designed to international standards, reliability has been extensively proved in a huge number of installations throughout the world, their heavy-duty construction being suitable for continuous operation over long periods. 'India' hand pumps are also simple to install and maintain at the village level using basic tools and cheap spare parts and they fulfill all aspects of UNDP/World bank hand pump specifications. Basic models are offered as follows:-

**India MKII** - Standard pump head with  $1\frac{1}{4}$ " GI drop pipes and  $2\frac{1}{2}$ " standard cylinder. Output is approx 15 litres/min at up to 40m depth.

**India MKIII** - Standard pump head with alternative of 2" GI or PVC drop pipes and 2" VLOM open top cap cast iron cylinder. Output is approximately 12 litres/min at up to 40m depth.

**India Extra Deepwell** - Heavy-duty pump head with extended counterbalanced handle,  $1\frac{1}{4}$ " GI drop pipe and  $2\frac{1}{2}$ " high pressure cylinder. Output is approximately 10 litres/min at up to 90m depth.

**India Forcelift** - Modified head with sealed water chamber to accommodate a 10m surface lift to an adjacent tank or water point with  $1\frac{1}{4}$ " GI or PVC drop pipes and  $2\frac{1}{2}$ " VLOM cast iron or 'Afridev' cylinder. Output is approximately 10 litres/min

### SPECIFICATIONS

#### Pump Head

Fabricated throughout from hot dipped galvanized mild steel components for corrosion protection with tri-leg pedestal design. Pre-greased ball bearings are provided at the handle for long life and ease of operation. Pump stroke is 125mm.

#### Cylinders

The following options are available:

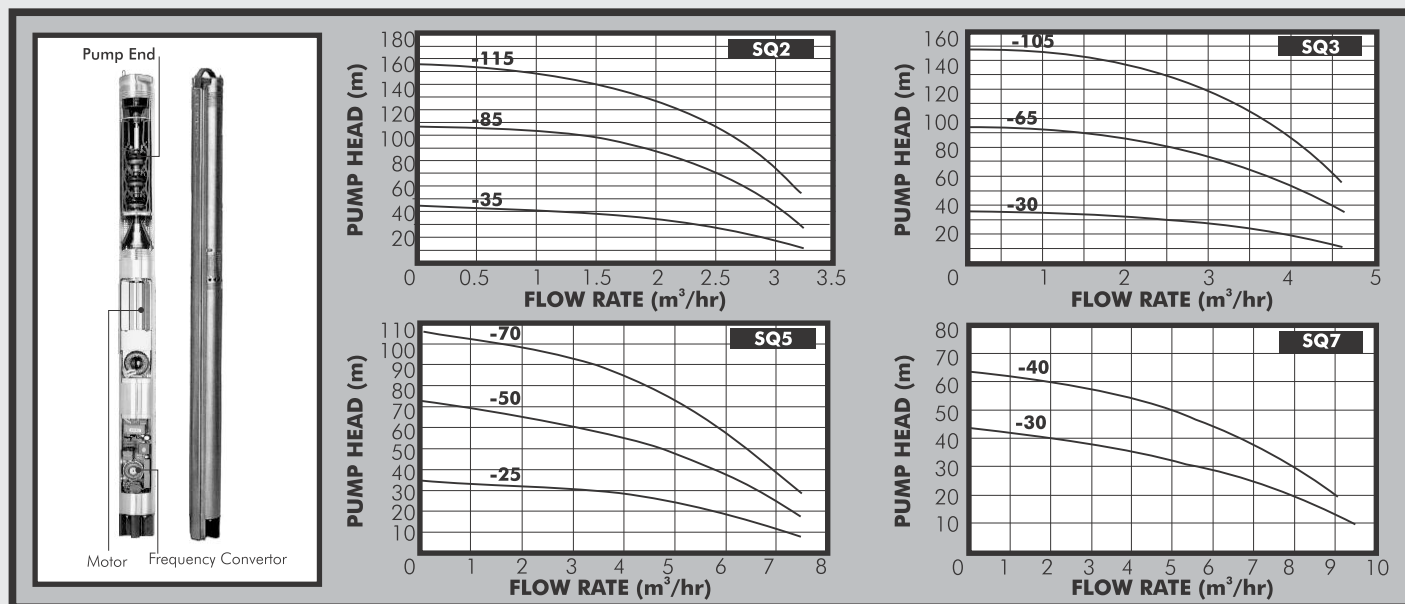
- $2\frac{1}{2}$ " (65mm) diameter Standard cylinder with brass liner, cast iron closed end caps and double nitrile rubber plunger seals. Capacity per stroke is 400cc.
- $2\frac{1}{2}$ " (65mm) diameter Extra Deepwell cylinder as above with triple nitrile rubber plunger rod seals. Capacity per stroke is 400cc.
- 2" (50mm) diameter VLOM cylinder with brass liner, cast iron open top end caps and double nitrile rubber plunger rod seals. Capacity is 250cc per stroke.
- 2" (50mm) diameter VLOM UPVC 'Afridev' cylinder with brass liner, plastic plunger and foot valve. Capacity is 250cc per stroke.

#### Rising Main

Option of  $1\frac{1}{4}$ " GI for closed cap cylinders and 2" GI/UPVC for VLOM 2" open top cap cylinders supplied in 3m lengths. PVC drop pipes require rod and pipe centralisers to prevent wear damage. Note that rising mains need removal for servicing of closed cap cylinders, though remain in place in VLOM installations.

#### Pump Rods

Option of 10mm electro galvanized mild steel or stainless steel rods in standard 3m lengths with screwed couplings.



### PUMP

The GRUNDFOS SQ range of compact submersible borehole pumps are suitable for both continuous and intermittent operation in a wide variety of applications. These include domestic water supply, water transfer and irrigation duties from both boreholes and tanks and due to excellent starting characteristics they are particularly suited to pressure control operation. The pumps offer a number of unique features provided by the built-in GRUNDFOS electronic motor controller including:-

- Run dry protection - no electrodes required
- Soft start design avoiding high electrical loads and water hammer - also ideal for generator operation
- Over and under voltage protection - ideal for unstable power conditions
- Overload and high temperature protection
- Excellent wear characteristics - can handle slightly silted waters
- 3" diameter to fit narrow boreholes.

Hydraulic components are made from polyamide plastic and the special design floating impellers each have a tungsten carbide/ceramic bearing. The pump sleeve, shaft and other principal components are made from stainless steel.

### MOTOR

The unique integrated GRUNDFOS MS3 high efficiency permanent magnet motor is controlled by a built in frequency converter which increases the standard mains frequency enabling the pump to run at high speed. All control functions are built into the frequency converter and no additional motor protection is required other than a 13amp fuse or MCB.

**Voltage:** 1 x 240V

**Speed:** 10,700rpm

**Power Factor:** 1

### OPERATING CONDITIONS

**Pump liquid:** Thin, clean, non aggressive liquids containing no solids or fibres.

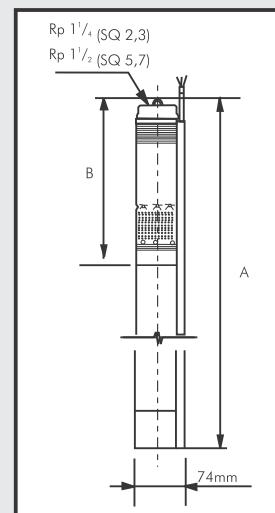
**Max. Water Temperature:** +30°C (no liquid flow past motor)  
+40°C (min 0.15 l/sec liquid flow past motor)

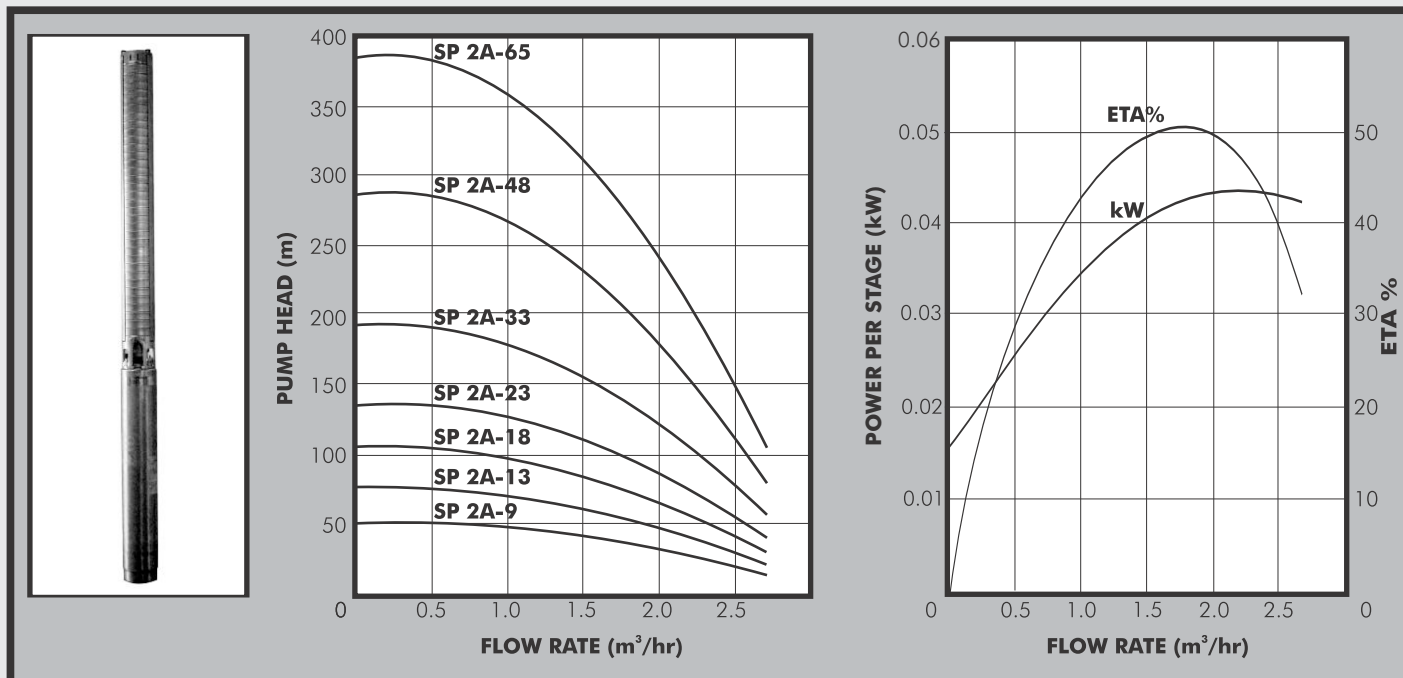
**Max Water depth:** 150m

**Min Borehole Diameter:** 80mm

### PUMP DATA

Pump Type	Number of Stages	Power (kW)	Running Current (A)	Dimensions (mm)		Weight (kg)
				A	B	
SQ 2-35	2	0.7	5.2	741	265	5
SQ 2-85	5	1.2	8.4	825	346	6
SQ 2-115	7	1.9	12.3	889	373	7
SQ 3-30	2	0.7	5.2	745	265	5
SQ 3-65	5	1.2	8.4	825	346	5
SQ 3-105	8	1.9	12.3	942	427	7
SQ 5-25	2	0.7	5.2	743	265	6
SQ 5-50	4	1.7	11.2	824	346	7
SQ 5-70	6	1.9	12.3	941	427	7
SQ 7-30	2	1.2	8.4	743	265	6
SQ 7-40	3	1.7	11.2	862	346	7





#### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. An 'N' version is available for applications requiring a higher degree of corrosion resistance.

#### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous squirrel-cage GRUNDFOS motor constructed of stainless steel. Single phase motors are supplied complete with purpose designed control boxes, while three phase motors require a remote Direct-on-Line starter. If unstable supply voltage is likely an additional quick tripping control relay is recommended.

**Enclosure Class:** IP58

**Insulation Class:** B

**Speed:** 2900 rpm

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids without solid particles or fibres.

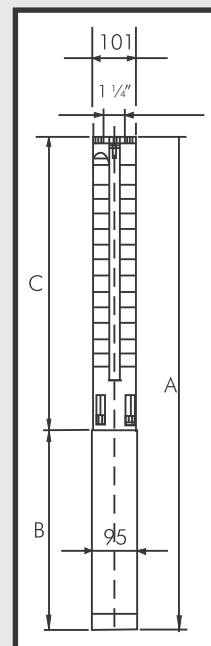
**Max Liquid Temperature:** +40°C.

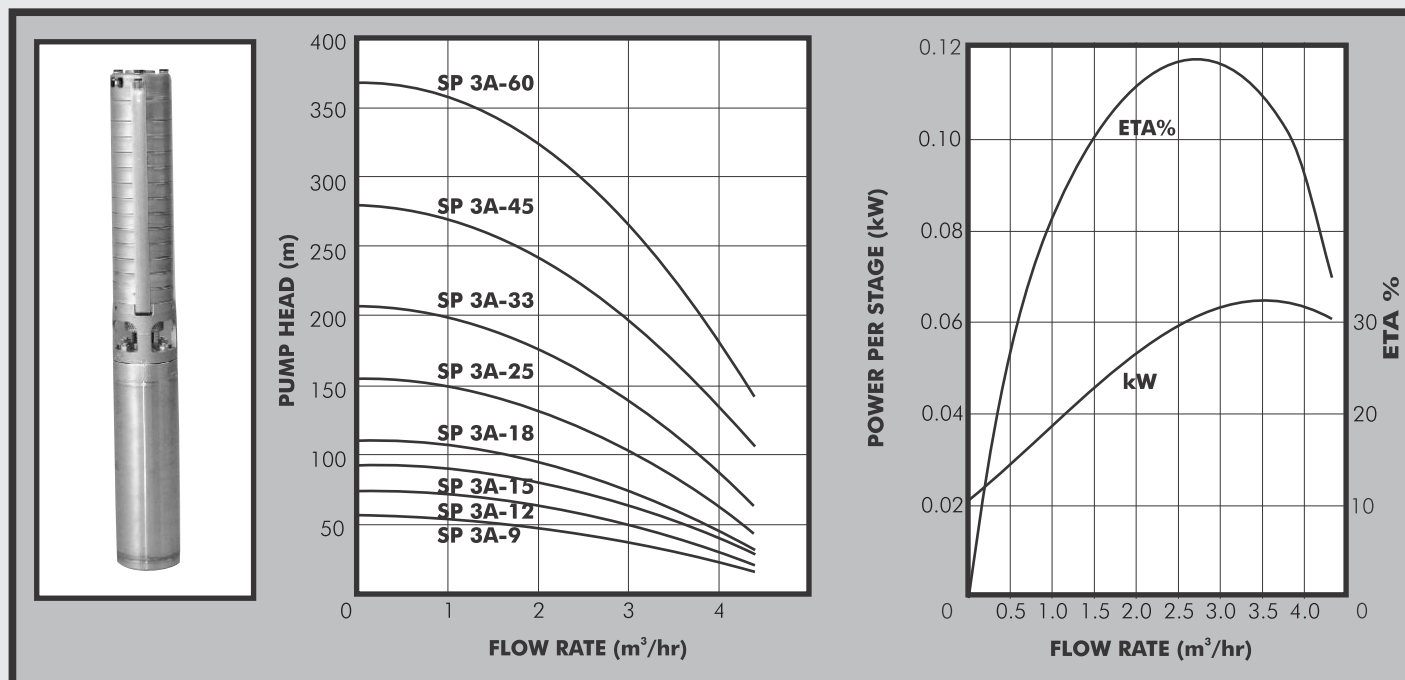
**Max Water Depth:** Up to 1.5 kW 1 ph and 2.2 kW 3 ph - 150 m  
2.2 kW 1 ph and 3 kW 3 ph - 600m

**Minimum Borehole Diameter:** 110mm

#### PUMP DATA

Model	Motor		Full Load current (A)		Start current (A)		Dimensions (mm)					Weight (kg)	
							A		B		C		
	kW	HP	1x240V	3x415V	1x240V	3x415V	1x240V	3x415V	1x240V	3x415V			
SP 2A-9	0.37	0.5	3.8		13		600		256		344	11	
SP 2A-13	0.55	0.75	5.5		19		719		291		428	13	
SP 2A-18	0.75	1.0	7.0		26		839		306		533	15	
SP 2A-23	1.1	1.5	7.1	3.7	31	16	984	944	346	306	638	17	16
SP 2A-33	1.5	2.0	9.8	4.4	38	21	1190	1190	346	346	844	20	19
SP 2A-48	2.2	3.0	14.0	5.7	62	26	1781	1554	573	346	1208	39	30
SP 2A-65	3.0	4.0		8.1		35		2058		493	1565		41





#### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. An 'N' version is available for applications requiring a higher degree of corrosion resistance.

#### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous squirrel-cage GRUNDFOS motor constructed of stainless steel. Single phase motors are supplied complete with purpose designed control boxes, while three phase motors require a remote Direct-on-Line starter. If unstable supply voltage is likely an additional quick tripping control relay is recommended.

**Enclosure Class:** IP58

**Insulation Class:** B

**Speed:** 2900 rpm

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids without solid.

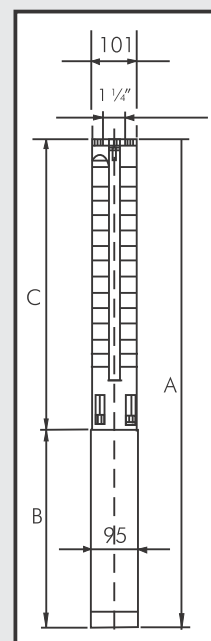
**Max Liquid Temperature:** +40°C

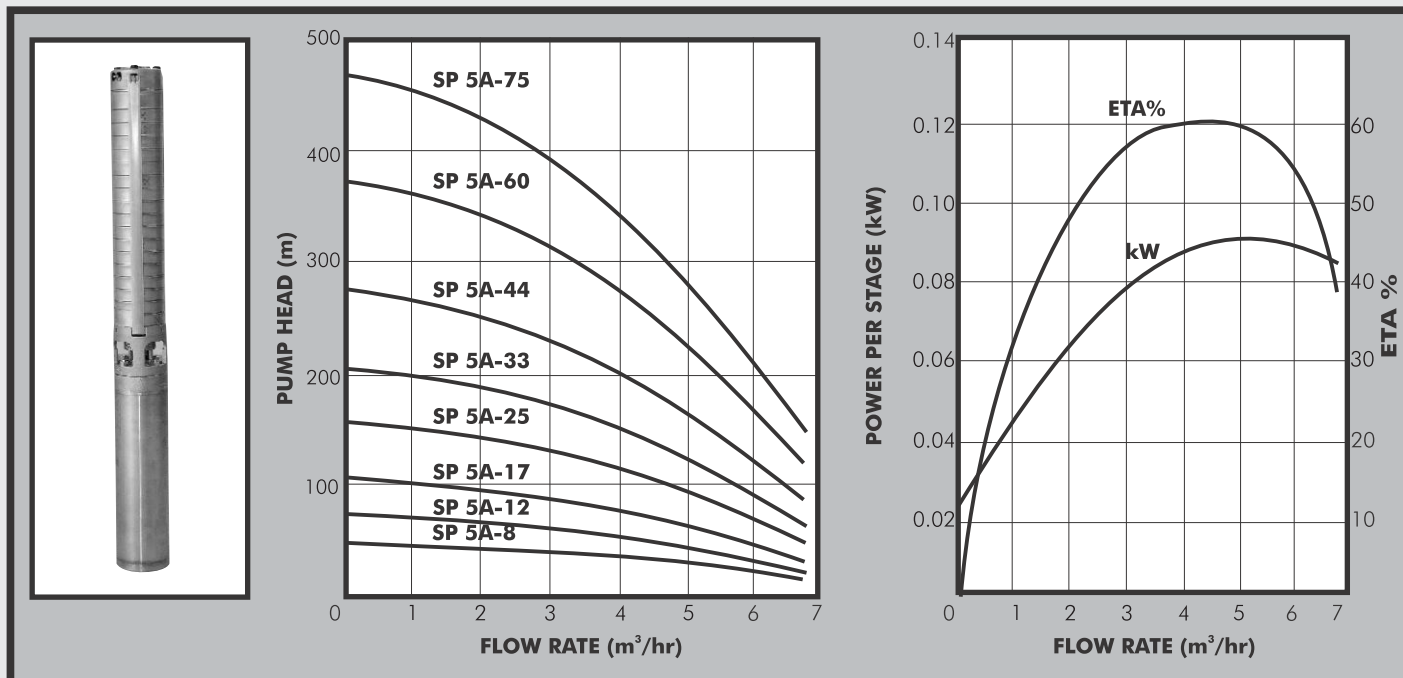
**Max Water Depth:** Up to 1.5 kW 1 ph and 2.2 kW 3 ph - 150 m  
2.2 kW 1 ph and 3 & 4 kW 3 ph - 600 m

**Minimum Borehole Diameter:** 110mm

#### PUMP DATA

Model	Motor		Full Load current (A)		Start current (A)		Dimensions (mm)					Weight (kg)	
							A		B		C		
	kW	HP	1x240V	3x415V	1x240V	3x415V	1x240V	3x415V	1x240V	3x415V		1x240V	3x415V
SP 3A-9	0.55	0.75	5.5		19		635		291		344	12	
SP 3A-12	0.75	1.0	7.0		26		713		306	276	407	13	
SP 3A-15	1.1	1.5	7.1	3.7	31	16	816	776	346	306	470	16	14
SP 3A-18	1.1	1.5	7.1	3.7	31	16	879	839	346	306	533	16	15
SP 3A-25	1.5	2.0	9.8	4.4	38	21	1026	1026	346	346	680	18	18
SP 3A-33	2.2	3.0	14.0	5.7	62	26	1421	1194	573	346	848	30	21
SP 3A-45	3.0	4.0		7.9		35		1638		493	1145		34
SP 3A-60	4.0	5.5		9.6		46		2033		573	1460		43





### PUMP

GRUNDFOS SP pumps are designed for a wide range of uses with a particular application to borehole supply. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. 'N' and 'R' versions are available for applications requiring a higher degree of corrosion resistance.

All SP pumps carry a drinking water approval and meet European Minimum Efficiency Index guidelines

### MOTOR

Pumps are coupled to sealed canned type liquid cooled 2-pole asynchronous GRUNDFOS motors constructed of stainless steel. Motors require remote controllers, the DAYLIFF electronic controller, which provides full control against fluctuating power input as well as wireless low level control being recommended for smaller motors and the GRUNDFOS MP204, which provides additional protection from mechanical failure as well as advanced monitoring features for motors of 7.5kW and above. Note that due to low starting torques of submersible motors direct on low starting is recommended for all motor sizes.

**Enclosure Class :** IP58

**Insulation Class:** F

**Speed:** 2900rpm

### OPERATING CONDITION

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +40°C

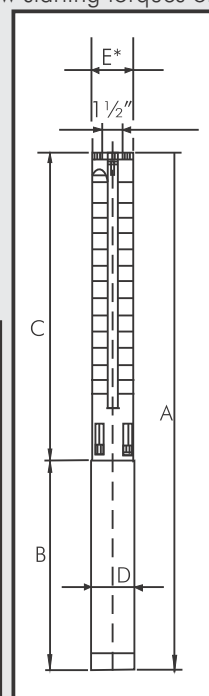
**Max. Water Depth:** Up to 1.5 kW 1 ph and 2.2kW 3ph - 150m, 2.2kW 1 ph, 3-7.5kW 3ph-600m

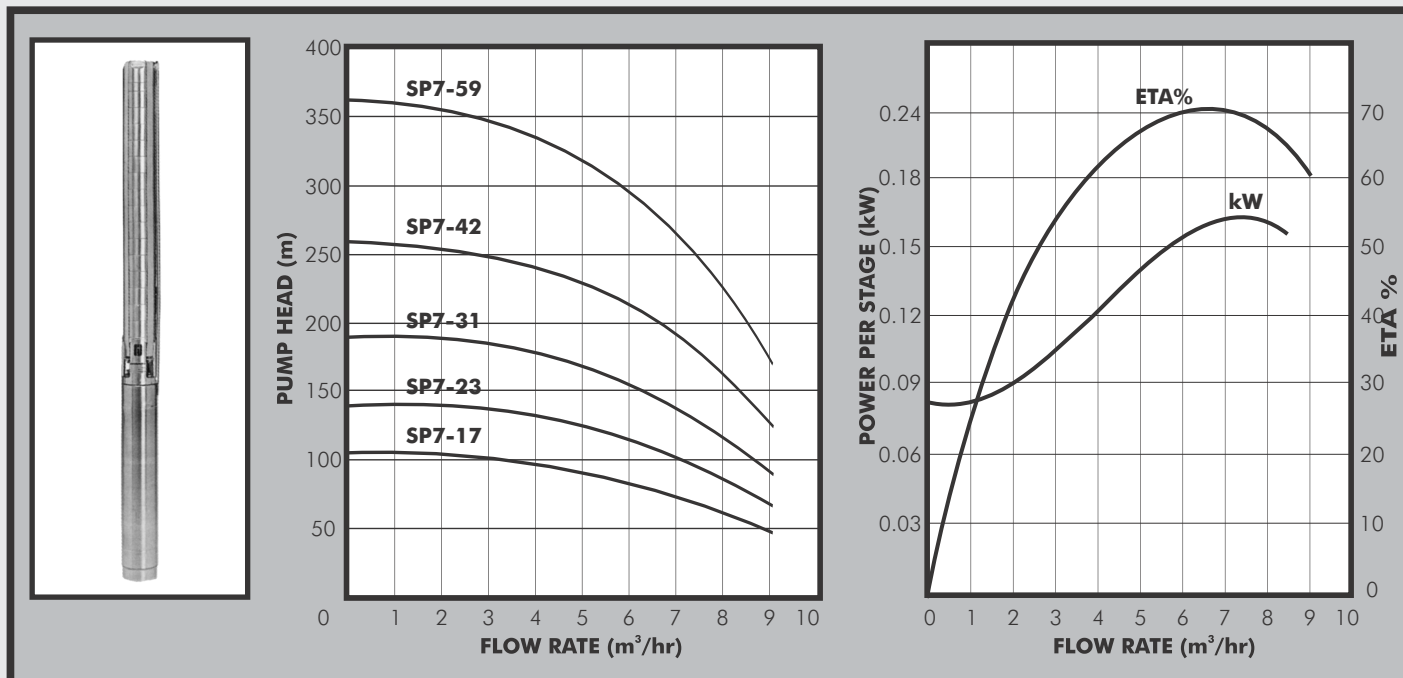
**Min. Borehole Diameter:** 110mm (4" motor), 152mm (6" motor)

### PUMP DATA

Pump Type	Motor Dia	Motor		Full Load Current (A)		Start Current (A)		Dimensions (mm)				C	D	E*	Weight (kg)	
		kW	HP	1x240 V	3x415 V	1x240 V	3x415 V	1x240 V	3x415 V	1x240 V	3x415 V				1x240 V	3x415 V
SP 5A-8	4"	0.75	1.0	7.0		26		630		306		324	95	101	13	
SP 5A-12	4"	1.1	1.5	7.1	3.4	31	16	754	714	346	306	408	95	101	15	13
SP 5A-17	4"	1.5	2.0	9.8	4.2	38	21	859	859	346	346	513	95	101	17	16
SP 5A-25	4"	2.2	3.0	14.0	5.5	62	26	1254	1027	573	346	681	95	101	28	19
SP 5A-33	4"	3.0	4.0		7.9		35		1342		493	849	95	101		26
SP 5A-44	4"	4.0	5.5		9.6		46		1697		573	1124	95	101		38
SP 5A-60	4"	5.5	7.5		13.0		64		2133		673	1460	95	101		60
	6"	5.5	7.5		13.6		69		2057		535	1522	143	138		63
SP 5A-75	6"	7.5	10		16.6		83		2711		565	2146	143	140		86

E\*=Maximum diameter of the pump inclusive of cable guard and motor





### PUMP

GRUNDFOS SP pumps are designed for a wide range of uses with a particular application to borehole supply. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. 'N' and 'R' versions are available for applications requiring a higher degree of corrosion resistance.

All SP pumps carry a drinking water approval and meet European Minimum Efficiency Index guidelines

### MOTOR

Pumps are coupled to sealed canned type liquid cooled 2-pole asynchronous GRUNDFOS motors constructed of stainless steel. Motors require remote controllers, the DAYLIFF electronic controller, which provides full control against fluctuating power input as well as wireless low level control being recommended for smaller motors and the GRUNDFOS MP204, which provides additional protection from mechanical failure as well as advanced monitoring features for motors of 7.5kW and above. Note that due to low starting torques of submersible motors direct on low starting is recommended for all motor sizing.

**Enclosure Class :** IP58

**Insulation Class:** F

**Speed:** 2900rpm

### OPERATING CONDITION

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids without solid.

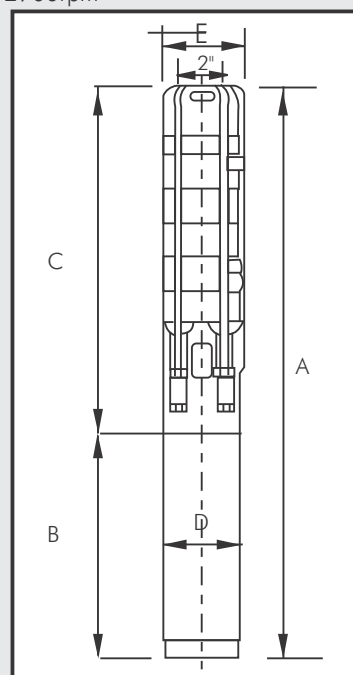
**Max. Liquid Temperature:** +40°C

**Max. Water Depth:** Up to 2.2 kW 3 ph -150 m and 3kW to 7.5kW 3ph -600m

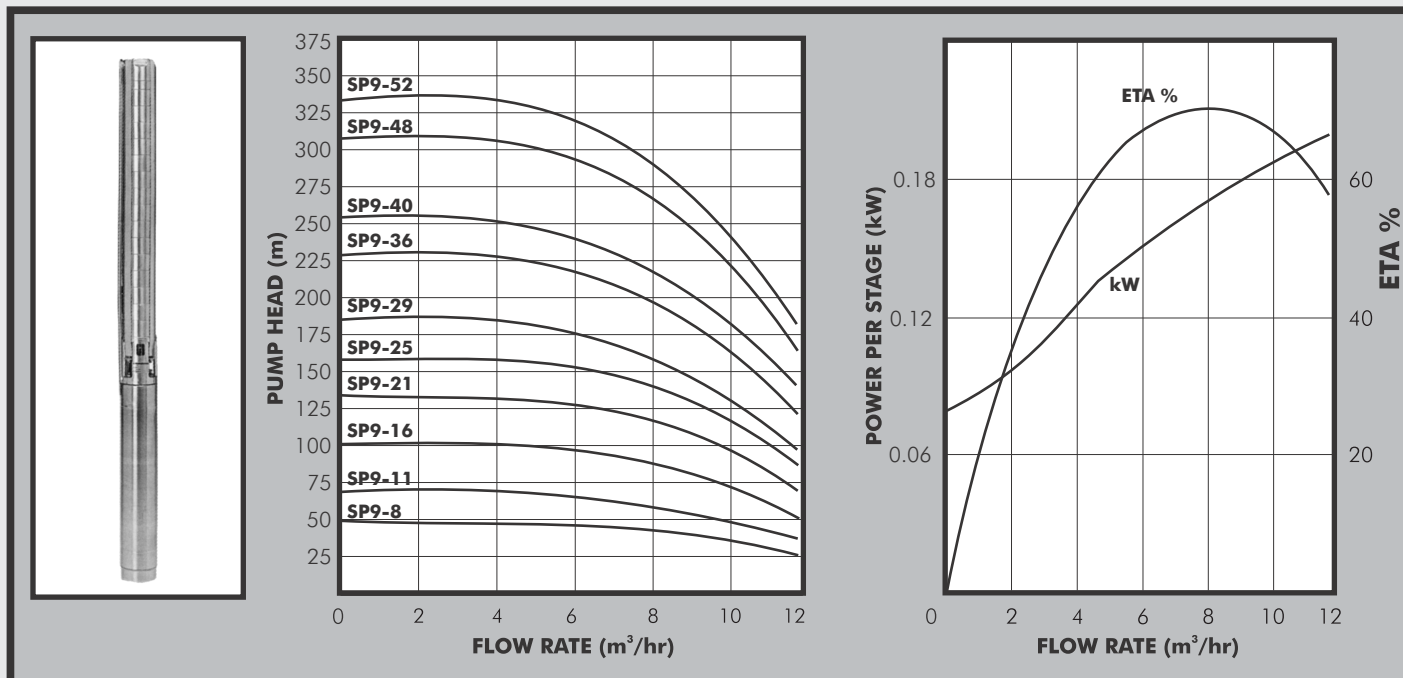
**Min. Borehole Diameter:** 110mm

### PUMP DATA

Pump Type	Motor Dia	Motor		Full Load Current (A)	Start Current (A)	Dimensions					Net Weight (kg)
		kW	HP			A	B	C	D	E	
SP 7-17	4"	2.2	3.0	5.5	26	1545	457	1088	95	101	27
SP 7-23		3.0	4.0	7.9	35	1885	497	1388			35
SP 7-31		4.0	5.5	9.7	58	2365	577	1788			44
SP 7-42		5.5	7.5	13	82	3105	677	2428			55
SP 7-59		7.5	10.0	18.8	118	3965	777	3188			79







### PUMP

GRUNDFOS SP pumps are designed for a wide range of uses with a particular application to borehole supply. They are of multistage centrifugal impeller design and all parts are made from 304 stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. An 'N' version is available for applications requiring a higher degree of corrosion resistance.

### MOTOR

Pumps are coupled to sealed canned type liquid cooled 2-pole asynchronous GRUNDFOS motors constructed of stainless steel. Motors require remote controllers, the DAYLIFF electronic controller, which provides full control against fluctuating power input as well as wireless low level control being recommended for smaller motors and the GRUNDFOS MP204, which provides additional protection from mechanical failure as well as advanced monitoring features for motors of 7.5kW and above.

Note that due to the low starting torques of submersible motors Direct-on-Line starting is recommended for all motor sizes.

**Enclosure Class :** IP58

**Insulation Class:** F

**Speed:** 2900 rpm

### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +40°C

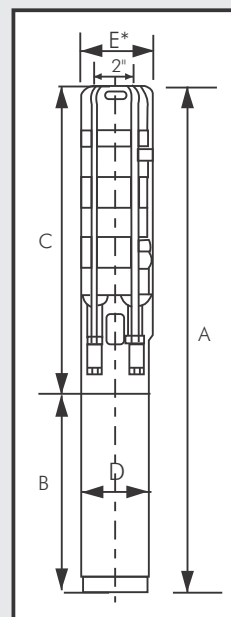
**Max. Water Depth:** Up to 1.5 kW 1ph & 2.2 kW 3 ph -150m

All other models -600m

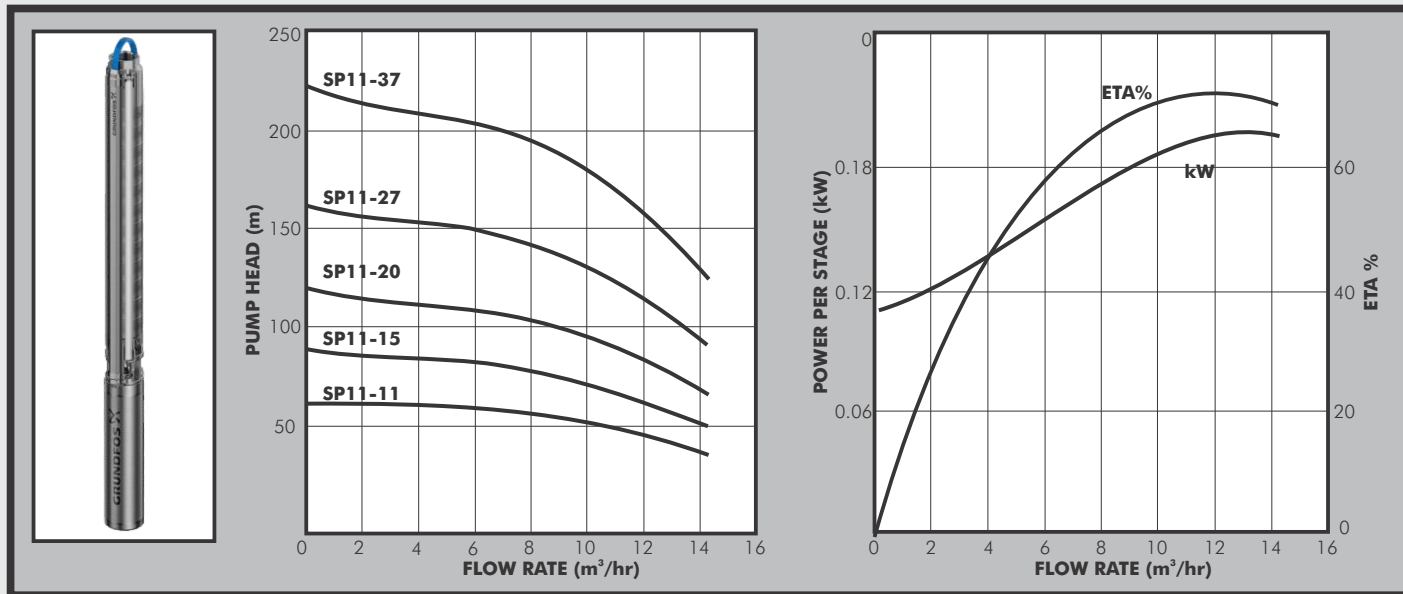
**Min. Borehole Diameter:** 110mm (4" motor), 152mm (6" motor)

### PUMP DATA

Pump Type	Motor Dia	Motor		Full Load Current (A)		Start Current (A)		Dimensions						Net Weight (kg)		
								A		B		C	D			E*
		kW	HP	1X240V	3X415V	1X240V	3X415V	1X240V	3X415V	1X240V	3X415V			1X240V	3X415V	
SP9-8	4"	1.5	2.0	10.2	4.2	56.1	21	1025	1025	387	387	638	95	101	22	22
SP9-11		2.2	3.0	14.0	5.5	98	26	1365	1175	577		788			34	25
SP9-16		3.0	4.0		7.9		35		1535		497	1038				56
SP9-21		4.0	5.5		9.6		58		1865		577	1288				44
SP9-25									2165			1488				80
SP9-29		5.5	7.5		13.0		82		2365		677	1688				83
SP9-36					18.8		118		2815		777	2038				94
SP9-40	6"	7.5	10.0		17.2		105		2878		577	2301	140	140		106
SP9-48		9.2	12.0		21.2		110		3308		607	2701				126
SP9-52		11.0	15.0		25.0		107		3538		637	2901				132



E\*=Maximum diameter of the pump inclusive of cable guard and motor



### PUMP

GRUNDFOS SP pumps are designed for a wide range of uses with a particular application to borehole supply. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. 'N' and 'R' versions are available for applications requiring a higher degree of corrosion resistance.

All SP pumps carry a drinking water approval and meet European Minimum Efficiency Index guidelines

### MOTOR

Pumps are coupled to sealed canned type liquid cooled 2-pole asynchronous GRUNDFOS motors constructed of stainless steel. Motors require remote controllers, the DAYLIFF electronic controller, which provides full control against fluctuating power input as well as wireless low level control being recommended for smaller motors and the GRUNDFOS MP204, which provides additional protection from mechanical failure as well as advanced monitoring features for motors of 7.5kW and above. Note that due to low starting torques of submersible motors direct on line starting is recommended for all motor sizing.

**Enclosure Class :** IP58

**Insulation Class:** F

**Speed:** 2900rpm

**Power:** 3x415V

### OPERATING CONDITION

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids without solid.

**Max. Liquid Temperature:** +40°C

**Max. Water Depth:** 600m

**Min. Borehole Diameter:** 110mm

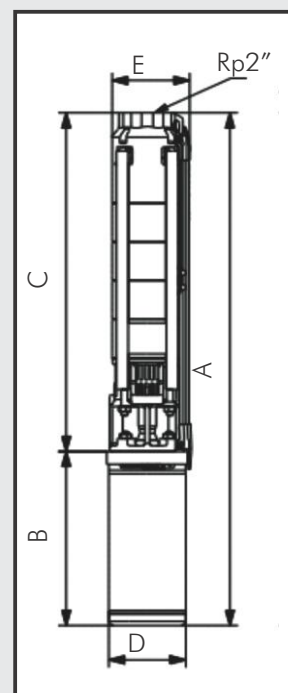
### ELECTRICAL DATA

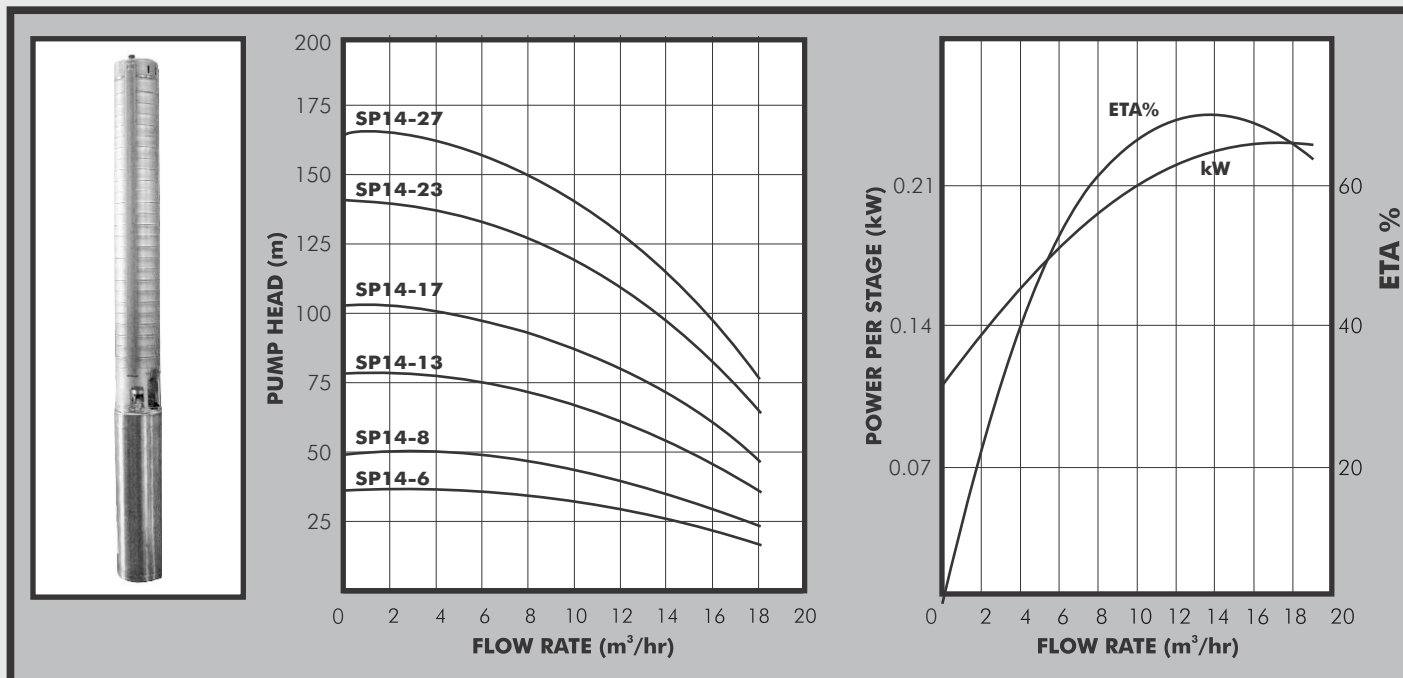
Pump Type	Motor		Full Load Current (A)	Start Current (A)
	kW	HP		
SP 11-11	2.2	3.0	5.7	4.7
SP 11-15	3.0	4.0	8.1	4.9
SP 11-20	4.0	5.5	9.8	5.3
SP 11-27	5.5	7.5	13.4	5.5
SP 11-37	7.5	10.0	19.6	5.5

### DIMENSIONS AND WEIGHTS

Pump Type	Dimensions (mm)					Weight (kg)
	A	B	C	D	E	
SP 11-11	1409	346	1063	95	101	26
SP 11-15	1860	497	1363			34
SP 11-20	2315	577	1738			42
SP 11-27	2940	677	2263			52
SP 11-37	3790	777	3013			64

E\* = Maximum diameter of the pump inclusive of cable guard and motor





### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from 304 stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. An 'N' version is available for applications requiring a higher degree of corrosion resistance.

### MOTOR

Pumps are coupled to sealed canned type liquid cooled 2-pole asynchronous GRUNDFOS motors constructed of stainless steel. Motors require remote controllers, the DAYLIFE electronic controller, which provides full control against fluctuating power input as well as wireless low level control being recommended for smaller motors and the GRUNDFOS MP204, which provides additional protection from mechanical failure as well as advanced monitoring features for motors of 7.5kW and above. Note that due to the low starting torques of submersible motors Direct-on-Line starting is recommended for all motor sizes.

**Enclosure Class :** IP58

**Insulation Class:** F

**Speed:** 2900 rpm

### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean chemically non-aggressive without solid particles or fibres.

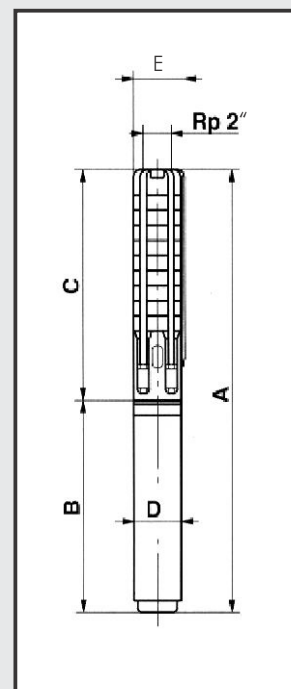
**Max. Liquid Temperature:** +40°C

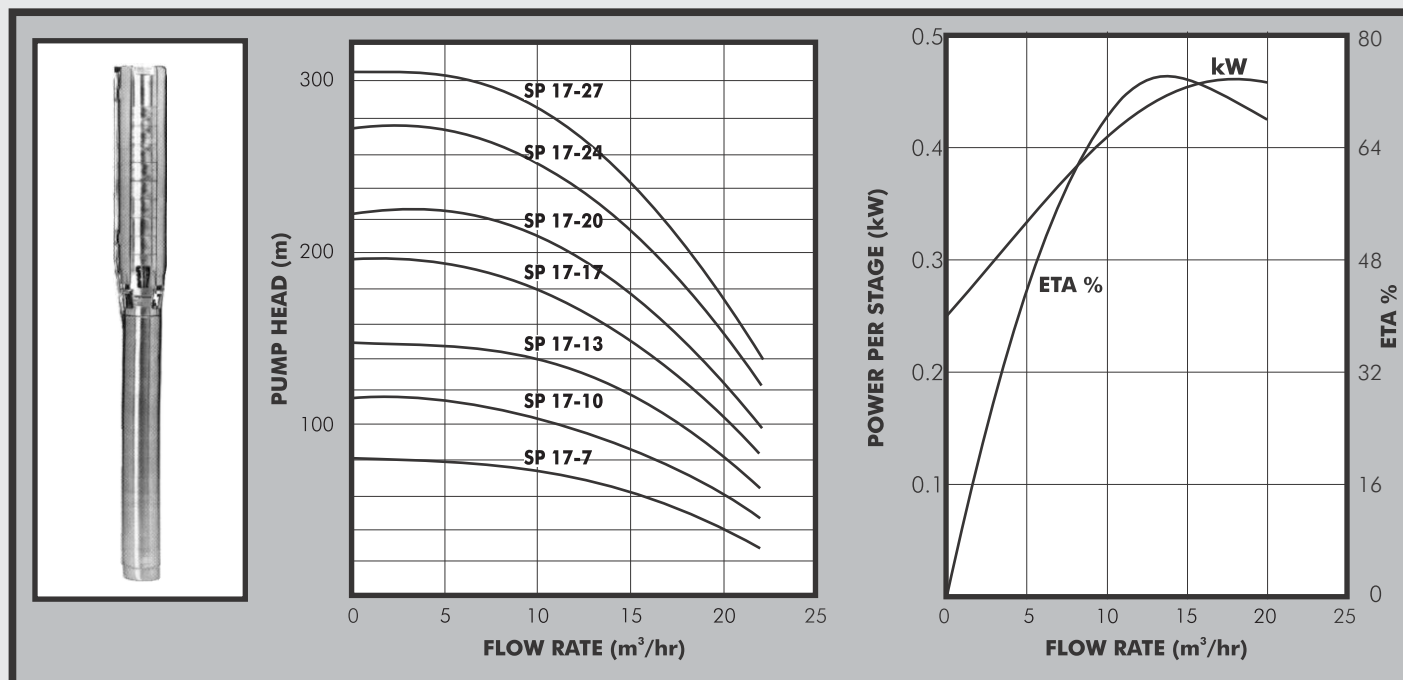
**Max. Water Depth:** 600m

**Min. Borehole Diameter:** 110mm(4" motors), 152mm (6" motors)

### PUMP DATA

Pump Type	Motor			Voltage (V)	Full Load Current (A)	Start Current (A)	Dimensions (mm)					Net Weight (kgs)
	Dia	kW	HP				A	B	C	D	E	
SP14-6	4"	1.5	2	1x240	10	40	1034	346	688	95	101	23
				3x415	4.2	21	1075	387				22
SP14-8		2.2	3	1x240	14	62	1414	576	838			34
				3x415	5.5	23	1225	387				25
SP14-13		3	4	3x415	7.9	35	1710	497	1213			38
SP14-17		4	5		9.6	58	2090	577	1513			74
SP14-23		5.5	7		13.7	75	2640	677	1963			87
SP14-27	6"	7.5	10		17.2	105	2903	577	2326	140	140	107





### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. 'N' and 'R' versions are available for applications requiring a higher degree of corrosion resistance.

All SP pumps carry a drinking water approval and meet European Minimum Efficiency Index guidelines

### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous GRUNDFOS motor constructed of stainless steel with ceramic bearings. All 6" motors are fitted with a built-in sensor which monitors running temperatures. When fitted with the patented GRUNDFOS MP 204 control unit protection is provided against dry running, mechanical motor defects, excessive motor running temperature and irregular power supply. The fitting of a MP 204 unit is recommended for motor control and monitoring and also extended motor life.

Note that irrespective of the fitting of a MP 204 control unit a remote starter is required. Due to the low starting torques of submersible motors it is recommended that Direct-on-Line starters are used for all motor sizes up to 22kW.

**Enclosure Class :** IP58

**Insulation Class:** 4" motors - B  
6" motors - F

**Voltage:** 3x415V

**Speed:** 2900rpm

### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +40°C

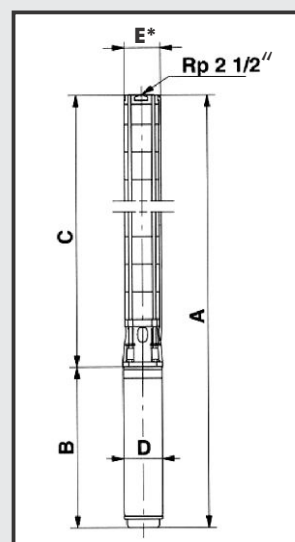
**Max. Water Depth:** 600 m

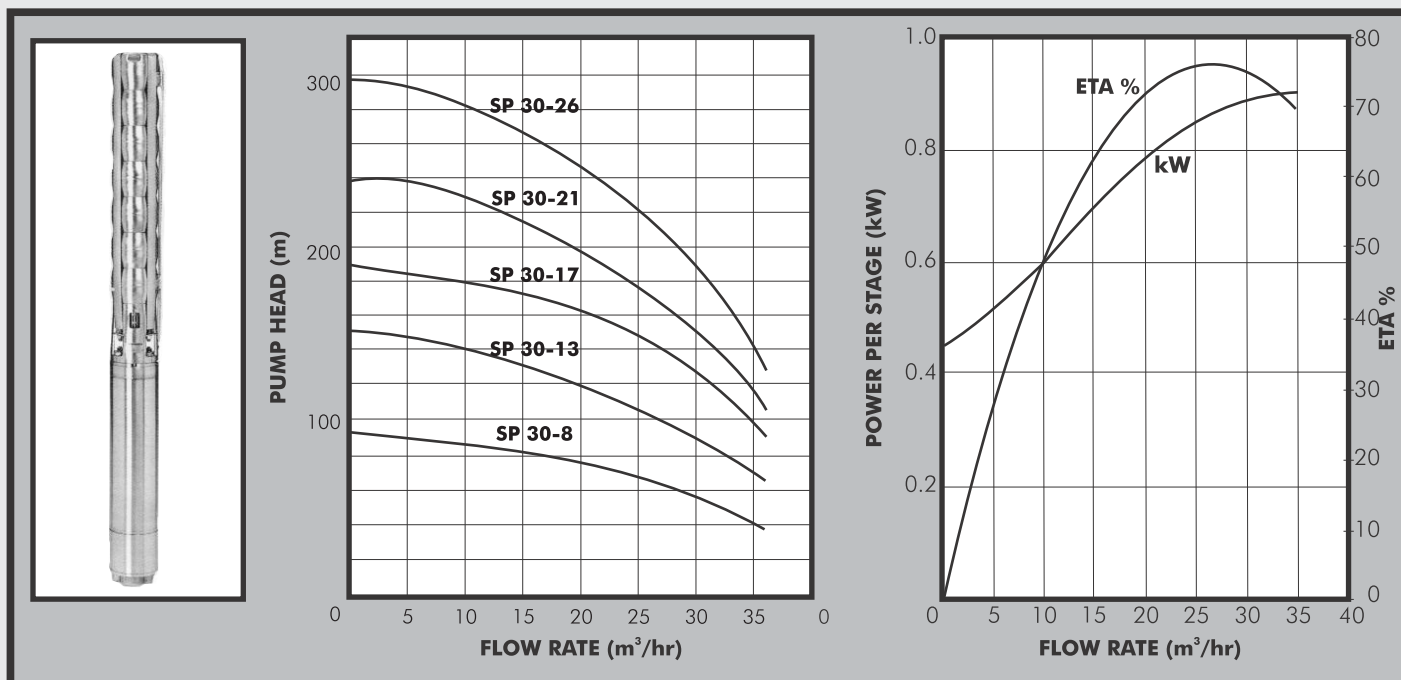
**Min. Borehole Diameter:** 152 mm (MS 6000), 110 mm (MS4000)

### PUMP DATA

Model	Motor		Full Load Current (A)	I <sub>start</sub> / I	Motor	Dimensions (mm)					Weight (kg)
	kW	HP				A	B	C	D	E*	
SP 17-7	4	5.5	9.7	5.0	MS 4000	1251	574	677	95	131	33
SP 17-10	5.5	7.5	13.7	5.5	MS 4000	1631	773	858	95	131	41
SP 17-13	7.5	10	17.6	4.9	MS 6000	1630	574	1056	138	142	57
SP 17-17	9.2	12.5	20.2	4.8	MS 6000	1888	590	1298	138	142	67
SP 17-20	11	15	24.8	4.7	MS 6000	2113	634	1479	138	142	74
SP 17-24	13	17.5	29	4.6	MS 6000	2429	708	1721	138	142	82
SP 17-27	15	20	34.0	5.0	MS 6000	2602	699	1903	138	142	89

E\* = Maximum diameter of the pump inclusive of cable guard and motor





### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. An 'N' version is available for applications requiring a higher degree of corrosion resistance.

### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous GRUNDFOS motor constructed of stainless steel with ceramic bearings. Motors are also fitted with a built-in sensor which monitors running temperature. When fitted with the patented GRUNDFOS MP 204 control unit protection is provided against dry running, mechanical motor defects, excessive motor running temperature and irregular power supply. The fitting of a MP 204 unit is recommended for motor control and monitoring and also extended motor life.

Note that irrespective of the fitting of a MP 204 control unit a remote starter is required. Due to the low starting torques of submersible motors it is recommended that Direct-on-Line starters are used for all motor sizes.

**Enclosure Class :** IP58

**Insulation Class:** H

**Voltage:** 3x415V

**Speed:** 2900rpm

### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +40°C

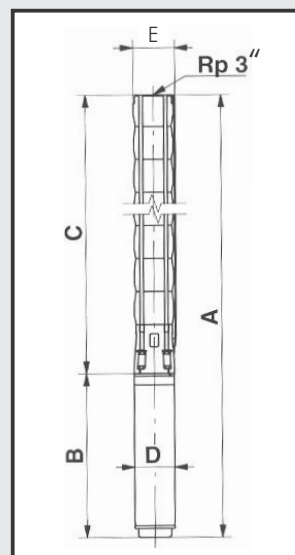
**Max. Water Depth:** 600 m

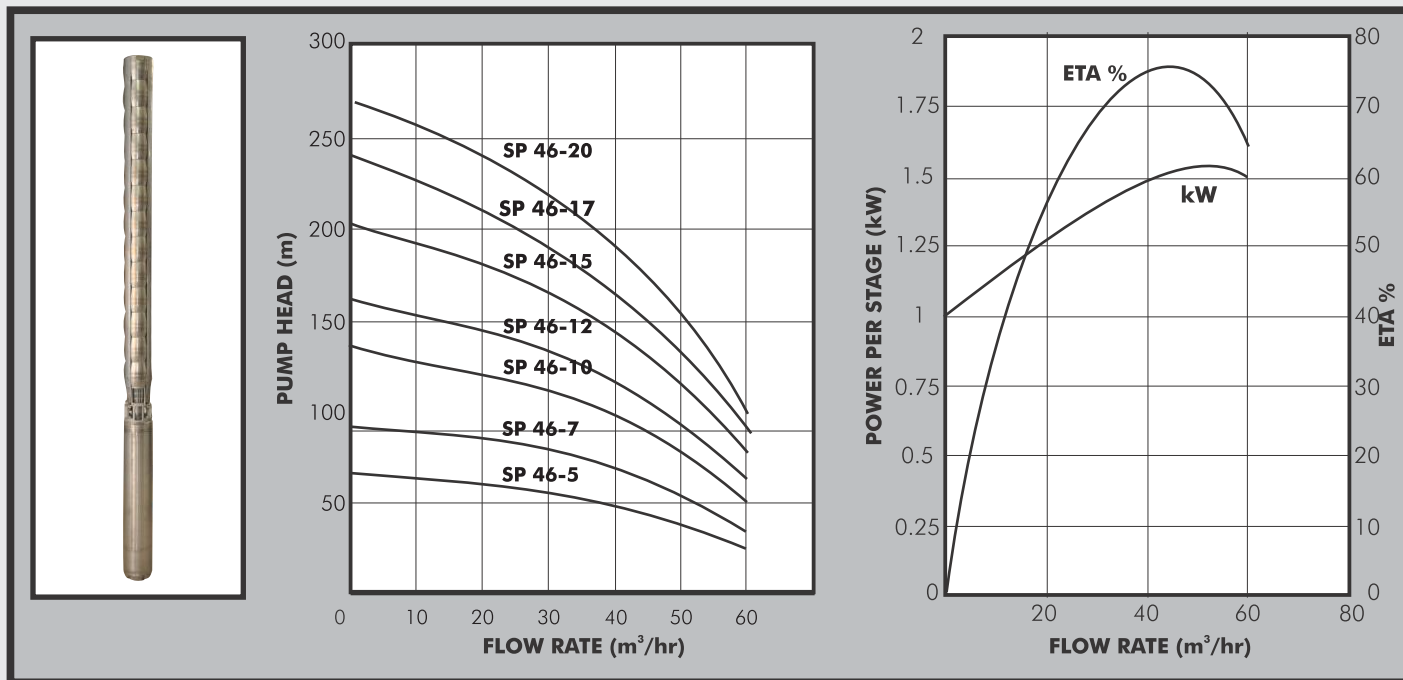
**Min. Borehole Diameter:** 200 mm

### PUMP DATA

Model	Motor		Full Load Current (A)	I start I	Motor	Dimensions (mm)					Net Weight (kg)
	kW	HP				A	B	C	D	E*	
SP 30-8	7.5	10	18.8	4.5	MS 6000	1602	565	1037	95	142	53
SP 30-13	11	15	24.8	4.7	MS 6000	2151	634	1517	138	142	72
SP 30-17	15	20	34.0	5.0	MS 6000	2600	699	1901	138	142	85
SP 30-21	18.5	25	42.2	5.1	MS 6000	3039	754	2285	138	142	98
SP 30-26	22	30	48.0	5.0	MS 6000	3579	814	2765	138	142	112

E\*=Maximum diameter of the pump inclusive of cable guard and motor





### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. 'N and R' versions are available for applications requiring a higher degree of corrosion resistance.

All SP pumps carry a drinking water approval and meet European Minimum Efficiency Index guidelines

### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous GRUNDFOS motor constructed of stainless steel with ceramic bearings. All motors are also fitted with a built-in sensor which monitors running temperatures. When fitted with the patented GRUNDFOS MP 204 control unit protection is provided against dry running, mechanical motor defects, excessive motor running temperature and irregular power supply. The fitting of a MP 204 unit is recommended for motor control and monitoring and also extended motor life.

Note that irrespective of the fitting of a MP 204 control unit a remote starter is required. Due to the low starting torques of submersible motors it is recommended that Direct-on-Line starters are used for all motor sizes up to 22kW.

**Enclosure Class :** IP58

**Insulation Class:** H

**Voltage:** 3x415V

**Speed:** 2900rpm

### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +40°C

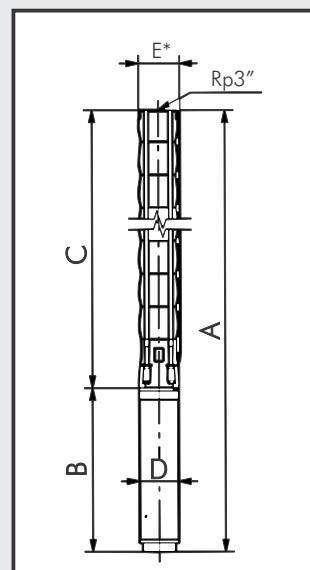
**Max. Water Depth:** 600 m

**Min. Borehole Diameter:** 200 mm

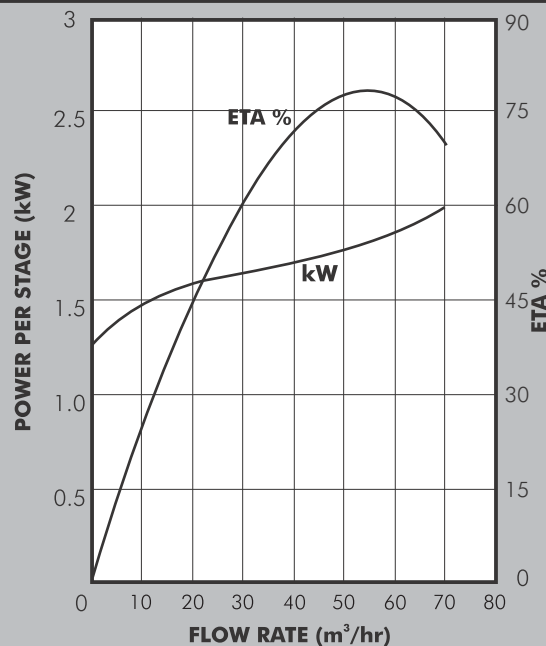
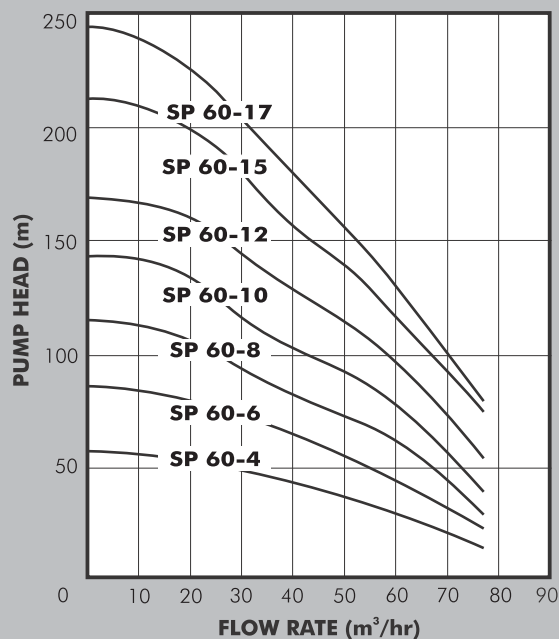
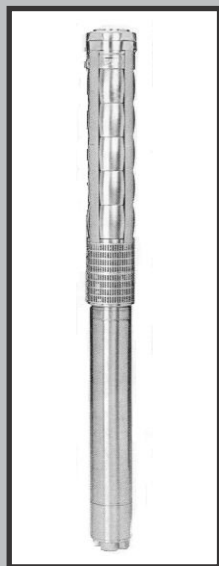
### PUMP DATA

Model	Motor		Full Load Current (A)	$\frac{I_{start}}{I}$	Motor	Dimensions (mm)					Weight (kg)
	kW	HP				A	B	C	D	E*	
SP 46-5	7.5	10	17.6	4.5	MS 6000	1406	574	832	138	147	54
SP 46-7	11	15	24.8	4.7	MS 6000	1698	634	1064	138	147	68
SP 46-10	15	20	34	5	MS 6000	2102	699	1403	138	147	82
SP 46-12	18.5	25	42	5.1	MS 6000	2383	754	1629	138	147	93
SP 46-15	22	30	48	5	MS 6000	2782	814	1968	138	147	106
SP 46-17	26	35	57	4.9	MS 6000	3068	874	2194	138	147	117
SP 46-20	30	40	66.5	4.9	MS 6000	3477	944	2533	138	147	132

E\* = Maximum diameter of the pump inclusive of cable guard and motor







#### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. 'N' and 'R' versions are available for applications requiring a higher degree of corrosion resistance.

All SP pumps carry a drinking water approval and meet European Minimum Efficiency Index guidelines

#### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous GRUNDFOS motor constructed of stainless steel with ceramic bearings. All motors are also fitted with a built-in sensor which monitors running temperatures. When fitted with the patented GRUNDFOS MP 204 control unit protection is provided against dry running, mechanical motor defects, excessive motor running temperature and irregular power supply. The fitting of MP204 unit is recommended for motor control and monitoring and also extended motor life.

Note that irrespective of the fitting of MP 204 control unit a remote starter is required. Due to the low starting torques of submersible motors it is recommended that Direct-on-Line starters are used on motor sizes up to 22kW.

**Enclosure Class :** IP58

**Insulation Class:** F

**Voltage:** 3x415 V

**Speed:** 2900rpm

#### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +40°C.

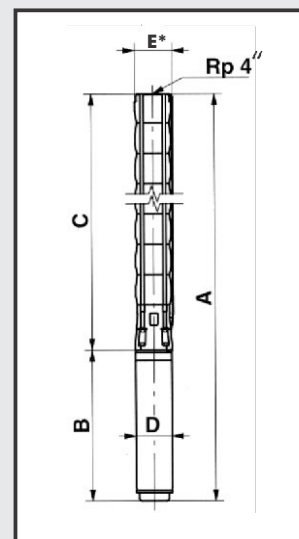
**Max. Water Depth:** 600 m

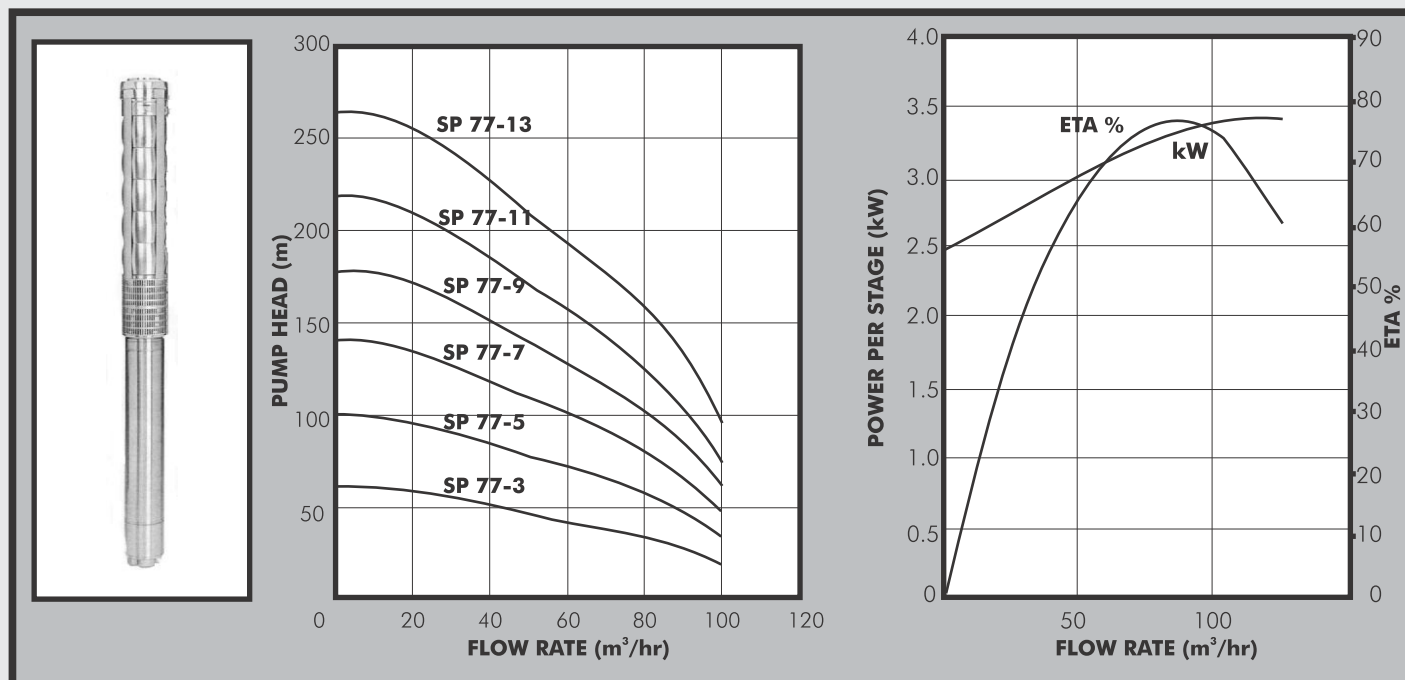
**Min. Borehole Diameter:** 200 mm

#### PUMP DATA

Model	Motor		Full Load Current (A)	I <sub>start</sub> I	Motor	Dimensions (mm)					Weight (kg)
	kW	HP				A	B	C	D	E*	
SP 60-4	7.5	10	18.8	4.5	MS 4000	1482	773	709	95	152	44
SP 60-6	11	15	24.8	4.7	MS 6000	1585	634	951	138	157	65
SP 60-8	15	20	34	5	MS 6000	1876	699	1177	138	147	77
SP 60-10	18.5	25	42	5.1	MS 6000	2157	754	1403	138	147	88
SP 60-12	22	30	48	5	MS 6000	2443	814	1629	138	147	99
SP 60-15	26	35	57	4.9	MS 6000	2842	874	1968	138	147	112
SP 60-17	30	40	66.5	4.9	MS 6000	3138	944	2194	138	147	125

E\* = Maximum diameter of the pump inclusive of cable guard and motor





#### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. An 'N' version is available for applications requiring a higher degree of corrosion resistance.

#### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous GRUNDFOS motor constructed of stainless steel with ceramic bearings. All motors are also fitted with a built-in sensor which monitors running temperatures. When fitted with the patented GRUNDFOS MP 204 control unit protection is provided against dry running, mechanical motor defects, excessive motor running temperature and irregular power supply. The fitting of MP 204 unit is recommended for motor control and monitoring and also extended motor life.

Note that irrespective of the fitting of MP 204 control unit a remote starter is required. Due to the low starting torques of submersible motors it is recommended that Direct-on-Line starters are used on motor sizes up to 22kW. Motors above this size should use a soft start arrangement.

**Enclosure Class :** IP58

**Insulation Class:** F

**Voltage:** 3x415 V

**Speed:** 2900rpm

#### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +40°C.

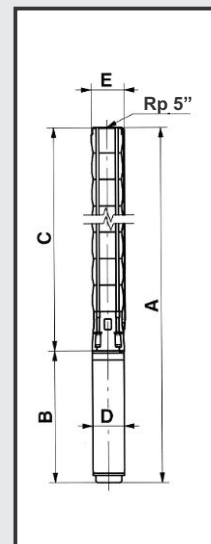
**Max. Water Depth:** 600 m

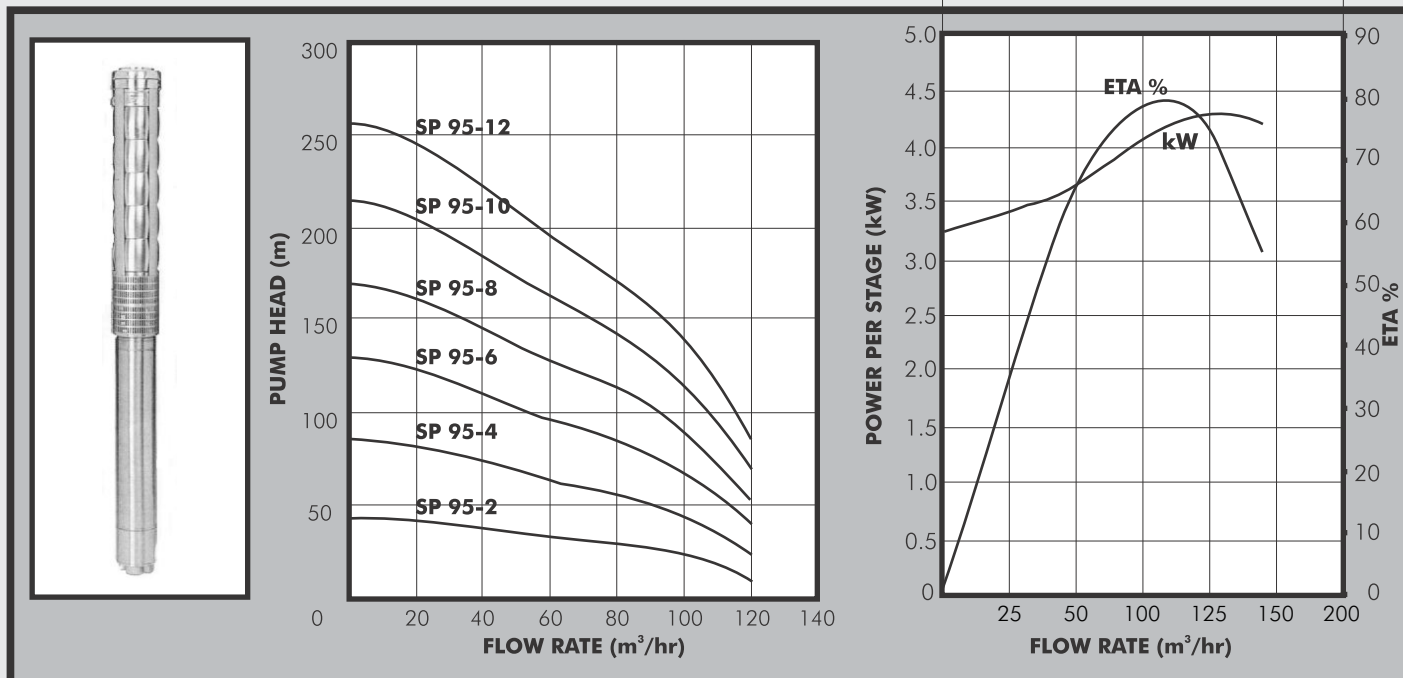
**Min. Borehole Diameter:** 200 mm - MS6/MMS6000  
254 mm - MMS8000

#### PUMP DATA

Pump Type	Motor		Full Load Current (A)	I start /	Motor	Dimensions (mm)					Weight (kg)
	kW	HP				A	B	C	D	E*	
SP 77-3	11	15	24.6	4.8	MS6	1557	683	874	143	200	75
SP 77-5	18.5	25	41.5	4.8	MS6	1914	784	1131	146	200	95
SP 77-7	26	35	57.5	5.2	MS6	2290	903	1387	143	200	114
SP 77-9	30	40	65	5.3	MS6	2611	968	1643	143	200	129
SP 77-11	37	50	80	4.3	MMS6000	3339	1425	1898	144	200	184
SP 77-13	55	74	114	5.9	MMS8000	3522	1350	2172	192	209	259

\*E=Maximum diameter of the pump with one motor cable





#### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. 'N' and 'R' versions are available for applications requiring a higher degree of corrosion resistance.

All SP pumps carry a drinking water approval and meet European Minimum Efficiency Index guidelines

#### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous GRUNDFOS motor constructed of stainless steel with ceramic bearings. All motors are also fitted with a built-in sensor which monitors running temperatures. When fitted with the patented GRUNDFOS MP 204 control unit protection is provided against dry running, mechanical motor defects, excessive motor running temperature and irregular power supply. The fitting of MP204 unit is recommended for motor control and monitoring and also extended motor life.

Note that irrespective of the fitting of MP 204 control unit a remote starter is required. Due to the low starting torques of submersible motors it is recommended that Direct-on-Line starters are used on motor sizes up to 22kW. Motors above this size should use a soft start arrangement.

**Enclosure Class :** IP58

**Insulation Class:** F

**Voltage:** 3x415 V

**Speed:** 2900rpm

#### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

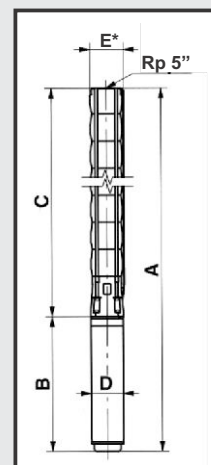
**Max. Liquid Temperature:** +40°C.

**Max. Water Depth:** 600 m

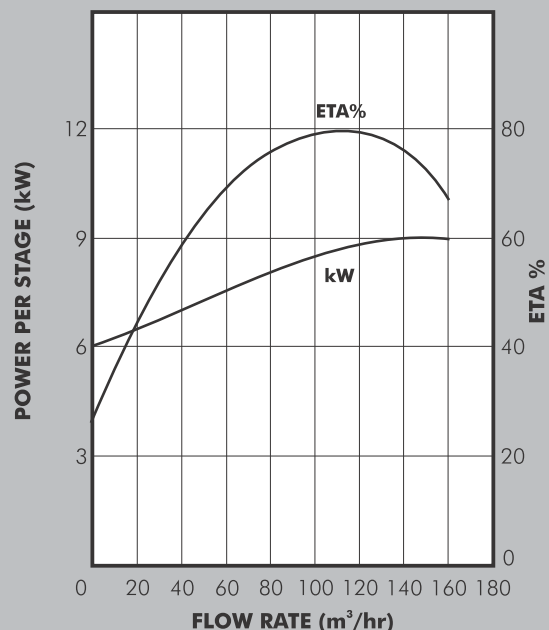
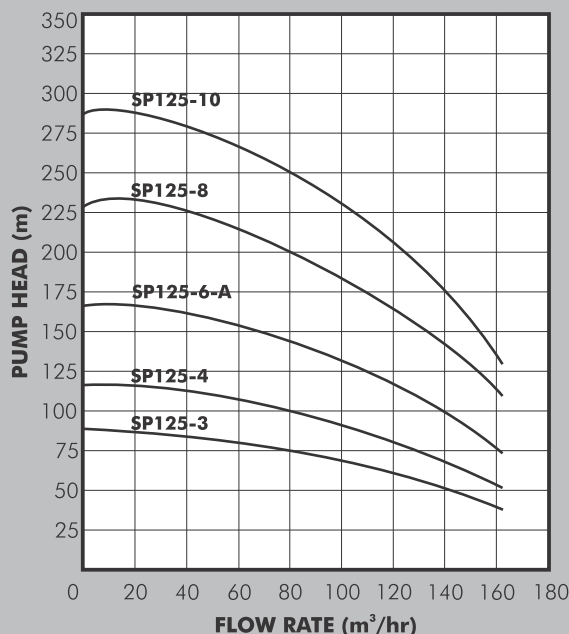
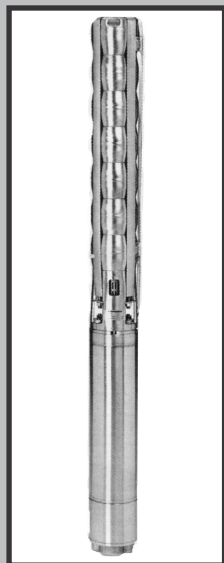
**Min. Borehole Diameter:** 200 mm - MS6/MMS6000, 254mm - MMS8000

#### PUMP DATA

Pump Type	Motor		Full Load Current (A)	I <sub>start</sub> I	Motor	Dimensions (mm)					Weight (kg)
	kW	HP				A	B	C	D	E*	
SP 95-2	9.2	12	20.2	4.9	MS6	1336	590	746	143	200	68
SP 95-4	18.5	25	41.5	4.8	MS6	1786	783	1003	143	200	91
SP 95-6	26	35	57.5	5.2	MS6	2162	903	1259	143	200	110
SP 95-8	37	50	80	4.3	MMS6000	2940	1425	1515	144	200	173
SP 95-10	45	60	96.5	6	MMS8000	3055	1270	1785	192	209	233
SP 95-12	55	74	114	5.9	MMS8000	3393	1350	2043	192	209	255



\*E=Maximum diameter of the pump with one motor cable



#### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. An 'N' version is available for applications requiring a higher degree of corrosion resistance.

#### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous GRUNDFOS motor constructed of stainless steel with ceramic bearings. All motors are also fitted with a built-in sensor which monitors running temperatures. When fitted with the patented GRUNDFOS MP 204 control unit protection is provided against dry running, mechanical motor defects, excessive motor running temperature and irregular power supply. The fitting of MP 204 unit is recommended for motor control and monitoring and also extended motor life.

Note that irrespective of the fitting of MP 204 control unit a remote starter is required. Due to the low starting torques of submersible motors it is recommended that Direct-on-Line starters are used on motor sizes up to 22kW. Motors above this size should use a soft start arrangement.

**Enclosure Class :** IP58

**Insulation Class:** F

**Voltage:** 3x415 V

**Speed:** 2900rpm

#### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

**Max. Liquid Temperature:** +40°C.

**Max. Water Depth:** 600 m

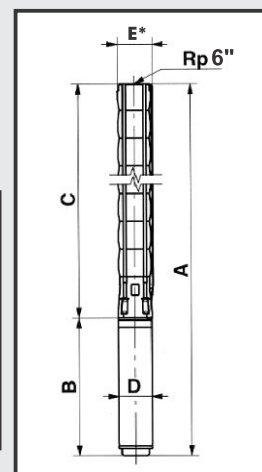
**Min. Borehole Diameter:** 200 mm - MMS6000, 254mm - MMS8000

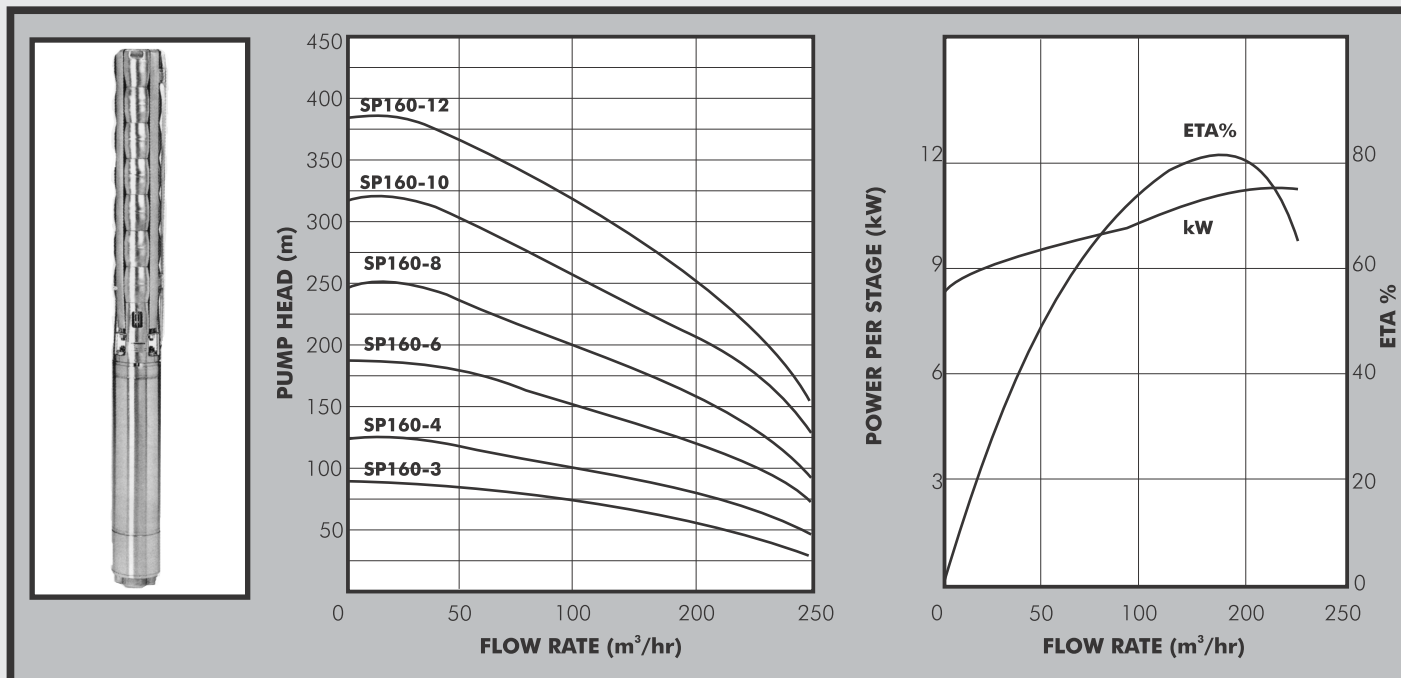
#### PUMP DATA

Pump Type	Motor		Full Load Current (A)	I start I	Motor	Dimensions (mm)					Weight (kg)
	kW	HP				A	B	C	D	E*	
SP125-3	30	40	63	4.9	MMS 6000	1907	944	963	139.5	211	123
SP125-4	37	50	85	5.1	MMS 6000	2431	1312	1119	143	211	171
SP125-6-A	55	73	112	5.9	MMS 8000	2781	1350	1431	192	213	257
SP125-8	75	100	152	5.4	MMS 8000	3333	1590	1743	192	218	314
SP125-10	92	123	186	5.6	MMS 8000	3885	1830	2055	192	218	372

The selection is not comprehensive and other sizes are available for specific duty point

E\* = Maximum diameter of the pump inclusive of cable guard and motor





### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. 'N and R' versions are available for applications requiring a higher degree of corrosion resistance.

All SP pumps carry a drinking water approval and meet European Minimum Efficiency Index guidelines

### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous GRUNDFOS motor constructed of stainless steel with ceramic bearings. All motors are also fitted with a built-in sensor which monitors running temperatures. When fitted with the patented GRUNDFOS MP 204 control unit protection is provided against dry running, mechanical motor defects, excessive motor running temperature and irregular power supply. The fitting of MP204 unit is recommended for motor control and monitoring and also extended motor life.

Note that irrespective of the fitting of MP 204 control unit a remote starter is required. Due to the low starting torques of submersible motors it is recommended that Direct-on-Line starters are used on motor sizes up to 22kW. Motors above this size should use a soft start arrangement.

**Enclosure Class :** IP58

**Insulation Class:** F

**Voltage:** 3x415 V

**Speed:** 2900rpm

### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

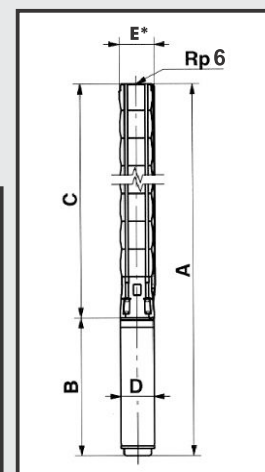
**Max. Liquid Temperature:** +40°C.

**Max. Water Depth:** 600 m

**Min. Borehole Diameter:** 200 mm - MS6/MMS6000, 254mm - MMS8000

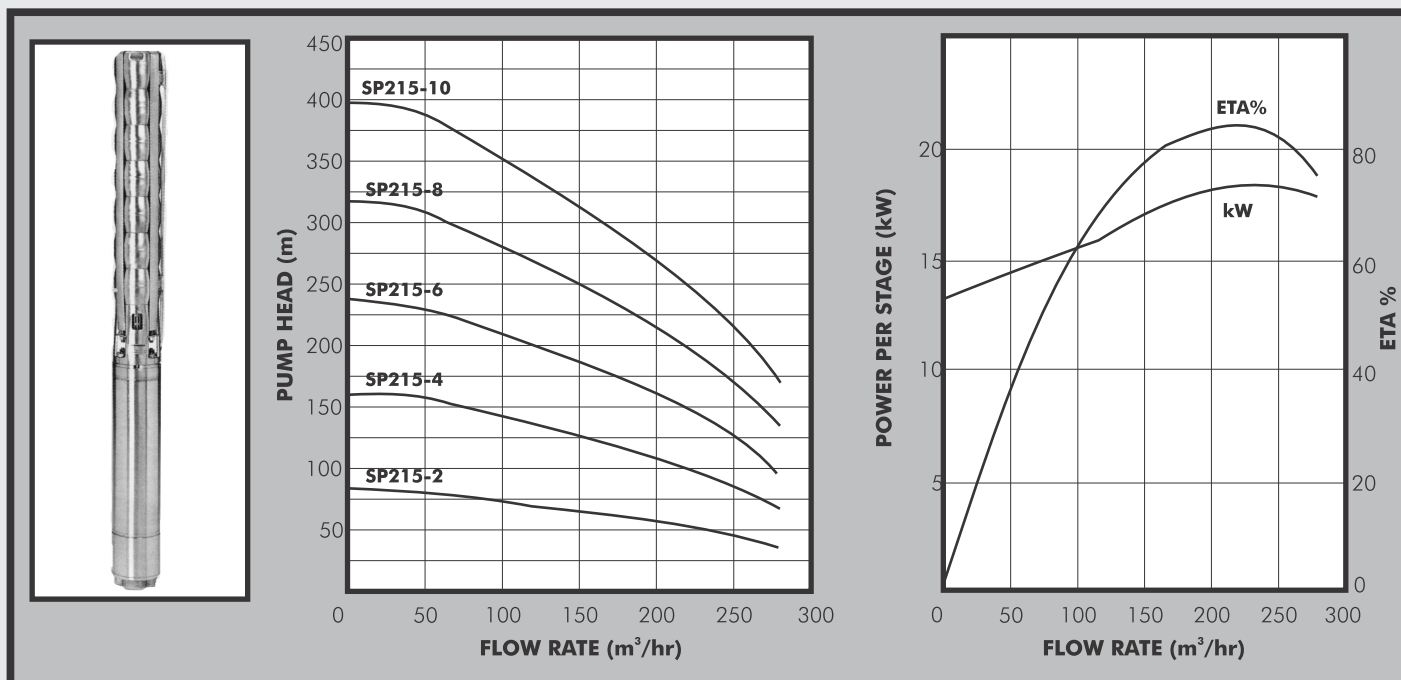
### PUMP DATA

Pump Type	Motor		Full Load Current (A)	I start I	Motor	Dimensions (mm)					Weight (kg)
	kW	HP				A	B	C	D	E*	
SP160-3	37	50	85	5.1	MMS 6000	2275	1312	963	143	211	165
SP160-4	55	73	112	5.9	MMS 8000	2469	1350	1119	192	218	245
SP160-6	75	100	152	5.8	MMS 8000	3021	1590	1431	192	218	302
SP160-8	92	123	186	5.9	MMS 8000	3573	1830	1743	192	218	360
SP160-10	132	176	270	5.7	MMS 10000	4273	1870	2403	237	237	544
SP160-12	147	196	320	6.2	MMS 10000	4784	2070	2714	237	237	621



The selection is not comprehensive and other sizes are available for specific duty point

E\*=Maximum diameter of the pump inclusive of cable guard and motor



#### PUMP

GRUNDFOS SP submersible pumps are designed specifically for borehole supply applications. They are of multistage centrifugal impeller design and all parts are made from stainless steel with water lubricated rubber bearings. A submersible motor is fitted beneath the pump and suction is effected through a strainer between the pump and motor.

Standard pumps are designed for the pumping of non-aggressive water. 'N and R' versions are available for applications requiring a higher degree of corrosion resistance.

All SP pumps carry a drinking water approval and meet European Minimum Efficiency Index guidelines

#### MOTOR

The pump is coupled to a sealed, liquid cooled 2-pole asynchronous GRUNDFOS motor constructed of stainless steel with ceramic bearings. All motors are also fitted with a built-in sensor which monitors running temperatures. When fitted with the patented GRUNDFOS MP 204 control unit protection is provided against dry running, mechanical motor defects, excessive motor running temperature and irregular power supply. The fitting of MP204 unit is recommended for motor control and monitoring and also extended motor life.

Note that irrespective of the fitting of MP 204 control unit a remote starter is required. Due to the low starting torques of submersible motors it is recommended that Direct-on-Line starters are used on motor sizes up to 22kW. Motors above this size should use a soft start arrangement.

**Enclosure Class :** IP58

**Insulation Class:** F

**Voltage:** 3x415 V

**Speed:** 2900rpm

#### OPERATING CONDITION

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids without solid particles or fibres.

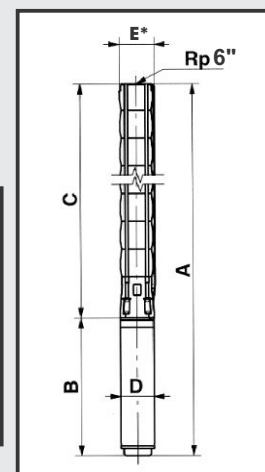
**Max. Liquid Temperature:** +40°C.

**Max. Water Depth:** 600 m

**Min. Borehole Diameter:** 254 mm -MMS8000, 268mm-MMS10000, 300mm-MMS12000

#### PUMP DATA

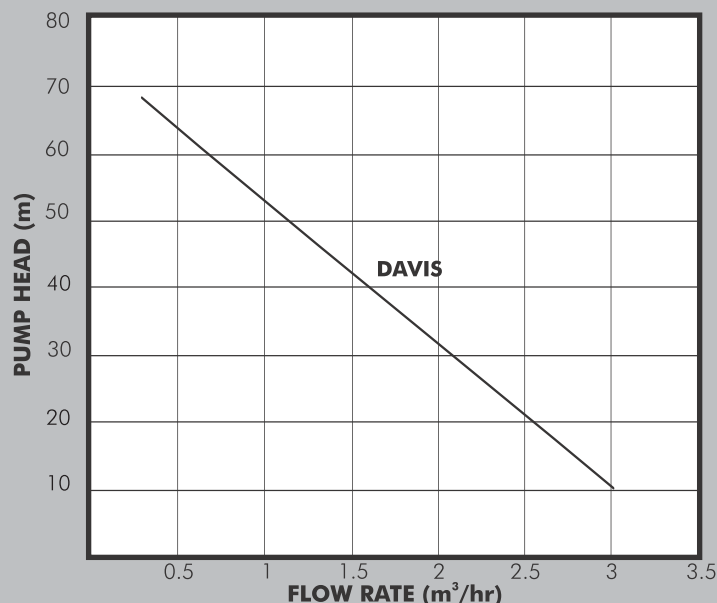
Pump Type	Motor		Full Load Current (A)	I start I	Motor	Dimensions (mm)					Weight (kg)
	kW	HP				A	B	C	D	E*	
SP215-2	45	60	96	6.0	MMS 8000	2236	1270	966	192	241	228
SP215-4	75	100	152	5.8	MMS 8000	2908	1590	1318	192	241	308
SP215-6	110	147	222	5.8	MMS 8000	3730	2060	1670	192	241	424
SP215-8	147	196	320	6.7	MMS 10000	4392	2070	2322	237	247	622
SP215-10	190	253	395	6.7	MMS 12000	4654	1980	2674	286	276	793



The selection is not comprehensive and other sizes are available for specific duty point

E\* = Maximum diameter of the pump inclusive of cable guard and motor





### PUMP

Pedrollo DAVIS peripheral impeller submersible pumps are designed for pumping clean water in domestic applications from boreholes and wells. They are based on the established 4SKm design though are much improved featuring a cast stainless steel pump housing with special anti-seize design, double mechanical seals to prevent water leakage in to the motor and built in thermal overload for motor protection.

All components in contact with water are manufactured from stainless steel with the impeller being made of brass. The motor capacitor is integral with the pump and no separate control unit is required. Pumps are supplied with 20m or 40m of drop cable to customer choice.

### MOTOR

All pumps are fitted with hermetically sealed re-windable liquid cooled induction motors designed for continuous duty provided the pump is fully submerged. They should be connected directly to mains supply through a 10A MCB or switch fuse.

**Enclosure Class:** IP68

**Insulation Class:** F

**Speed:** 2900 rpm

**Voltage:** 1x 240V

**Power:** 0.75kW

**Max. Current:** 5.5A

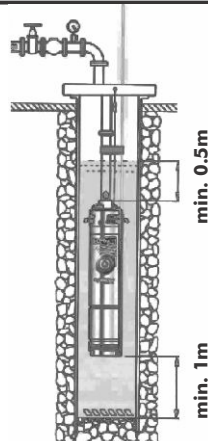
### OPERATING CONDITIONS

**Pumped Liquid:** Thin, chemically non-aggressive liquids, without solid particles.

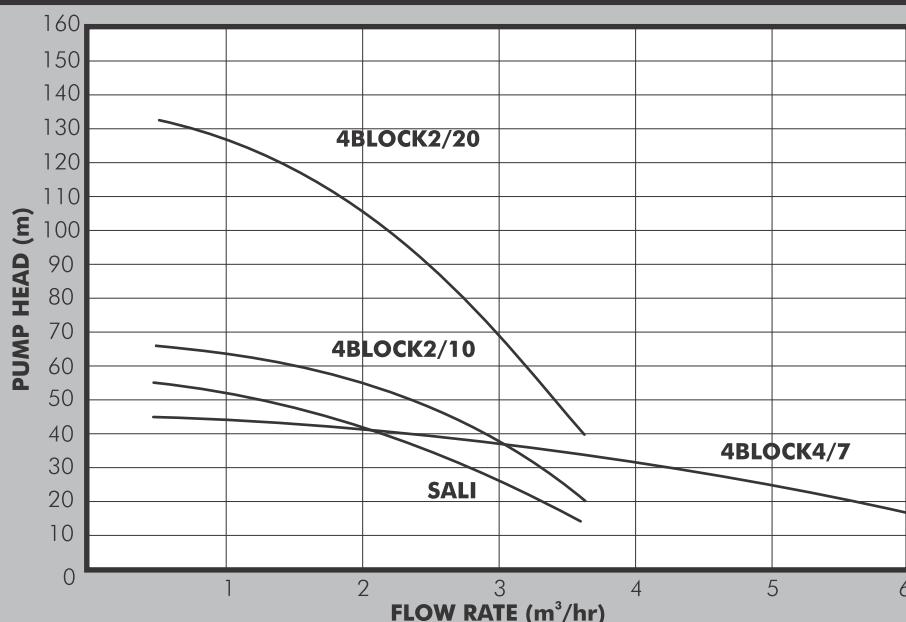
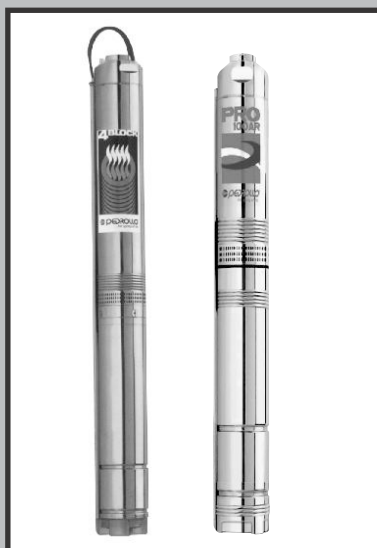
**Max. Fluid Temperature:** +40°C

**Max. Operating Depth:** 40m

### DIMENSIONS & WEIGHTS



**Weight:** 12.6kgs



### PUMP

The Pedrollo 4BLOCK/SALI is an innovative adaptation of the conventional 4SR borehole submersible pump design incorporating an integral pump/motor unit in one compact unit. Hydraulic and motor components are the same, though they are encased in a one-piece housing thus providing a more economic alternative to the traditional borehole pump. Particular features include:-

- High resistance technopolymer hydraulic components providing the pump with a light silt passing capability.
- Integrated design incorporating a built-in capacitor so no separate control unit is required.
- 20m drop cable supplied as standard.

The 4BLOCK/SALI range is particularly suitable to all small-scale domestic installations particularly for boreholes, though they can also be used in wells in either vertical or horizontal configuration. All pump components other than the technopolymer impellers and diffusers are manufactured from AISI304 grade stainless steel.

### MOTOR

Pumps are fitted with integral two-pole Pedrollo motors constructed principally from stainless steel. A built-in thermal overload for motor protection is provided so the pump can be connected directly to the mains power supply through a 10A fuse or MCB.

**Enclosure Class:** IP68

**Installation Class:** F

**Voltage:** 1 x 240V

**Speed:** 2900rpm

### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean chemically non-aggressive liquids with maximum sand content of 150gm/m³

**Max Liquid Temp:** +35°C

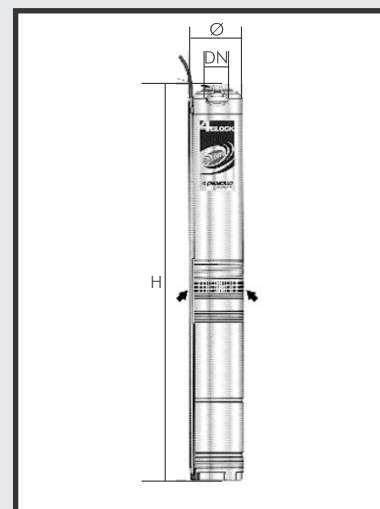
**Max Submersion Depth:** 4Block:60m

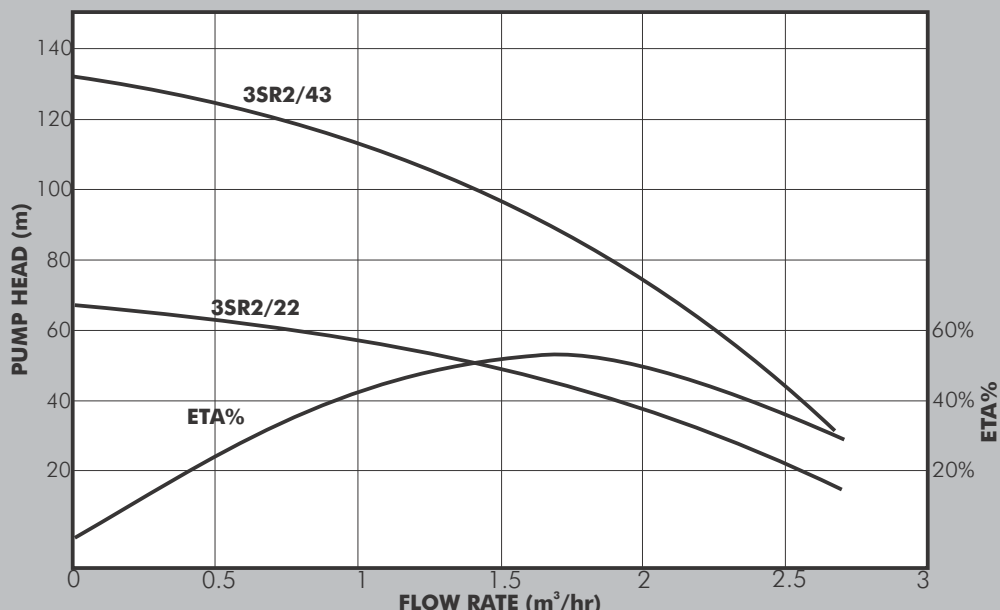
SALI:40m

**Min Borehole Diameter:** 110mm

### PUMP DATA

Model	Power (kW)	Current (A)	DN	Dimensions (mm)		Weight (kg)
				H	Ø	
4BLOCKm 2/10	0.55	5.0	1 ¼"	705	100	12.5
4BLOCKm 4/7	0.55	5.0	1 ¼"	663	100	12
SALI	0.75	6	1"	591	100	12
4BLOCKm 2/20	1.1	8.0	1 ¼"	987	100	18





### PUMP

Pedrollo 3SR2 submersible pumps are specifically designed for domestic and small scale water supply from boreholes, though can also be used in other submersible applications in either vertical or horizontal configuration. They feature a hydraulic design that incorporates floating impellers which together with especially resistant component materials provide high resistance to sand content in the pumped water.

The pump impellers and diffusers are made from technopolymer while the stage casings, top housing, suction connector, pump sleeve and shaft are made of AISI 304 stainless steel. The pump is supplied with a 1.5m tail cable.

### MOTOR

Pumps are coupled to a two pole sealed oil filled motor constructed principally from AISI 304 stainless steel. A separate control box is also recommended for single phase pumps which incorporates a fused rotary switch, run indicator light, thermal overload with manual reset and capacitor which can be connected directly to the mains power supply.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900rpm

### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non aggressive liquids with a maximum sand content of 150gm/m<sup>3</sup>.

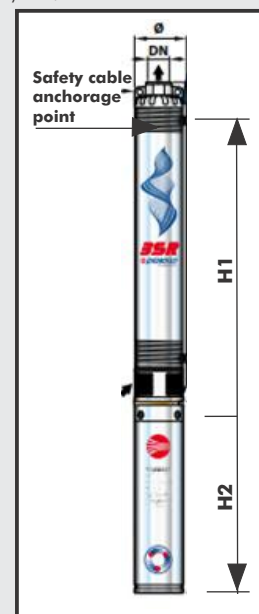
**Max. Liquid Temperature:** +30°C.

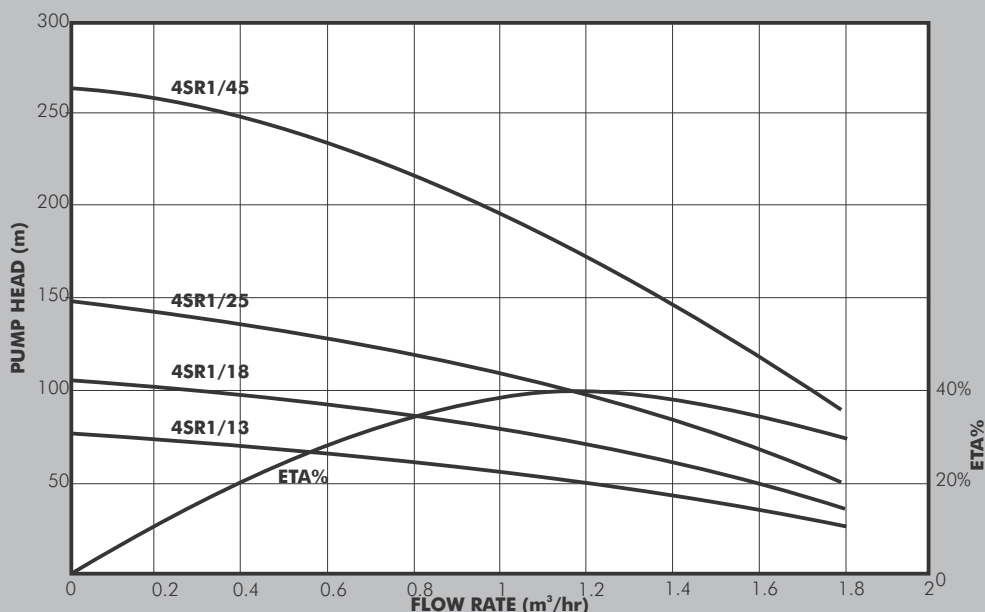
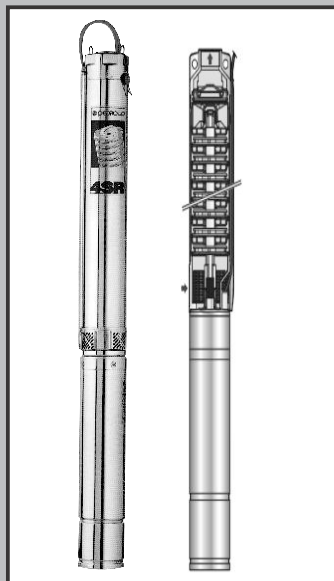
**Min. Borehole Diameter:** 110mm

**Max. Immersion depth:** 60mm

### PUMP DATA

Model	Motor		Current (A)	DN (")	Dimensions (mm)			Weight (kg)
	kW	HP	1X240V		Ø	H1	H2	
3SR2/22	0.55	0.75	4.5	1	76	738	393	11
3SR2/43	1.1	1.5	3.5			1250	433	15.3





### PUMP

Pedrollo 4SR1 submersible pumps are specifically designed for domestic and small scale water supply from boreholes, though can also be used in other submersible applications in either vertical or horizontal configuration. They feature a hydraulic design that incorporates floating impellers which together with especially resistant component materials provide high resistance to sand content in the pumped water.

The pump impellers and diffusers are made from technopolymer while the stage casings, top housing, suction connector, pump sleeve and shaft are made of AISI 304 stainless steel. The pump is supplied with a 1.5m tail cable.

### MOTOR

Pumps are coupled to a two pole sealed oil filled motor constructed principally from AISI 316 stainless steel. A separate control box is recommended for single phase pumps which incorporates a fused rotary switch, run indicator light, DOL starter and capacitor which can be connected directly to the mains power supply. 3 phase motors require a remote starter and if irregular electrical supply is prevalent an additional quick tripping voltage sensing relay is recommended.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900rpm

### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non aggressive liquids with a maximum sand content of 150gm/m<sup>3</sup>.

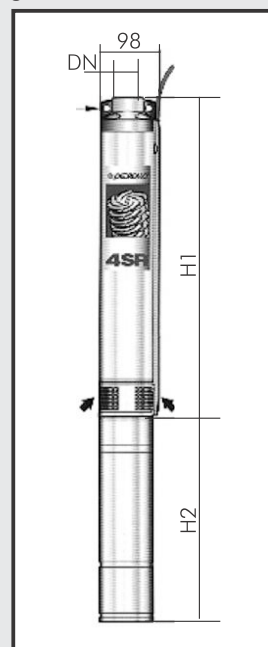
**Max. Liquid Temperature:** +30°C.

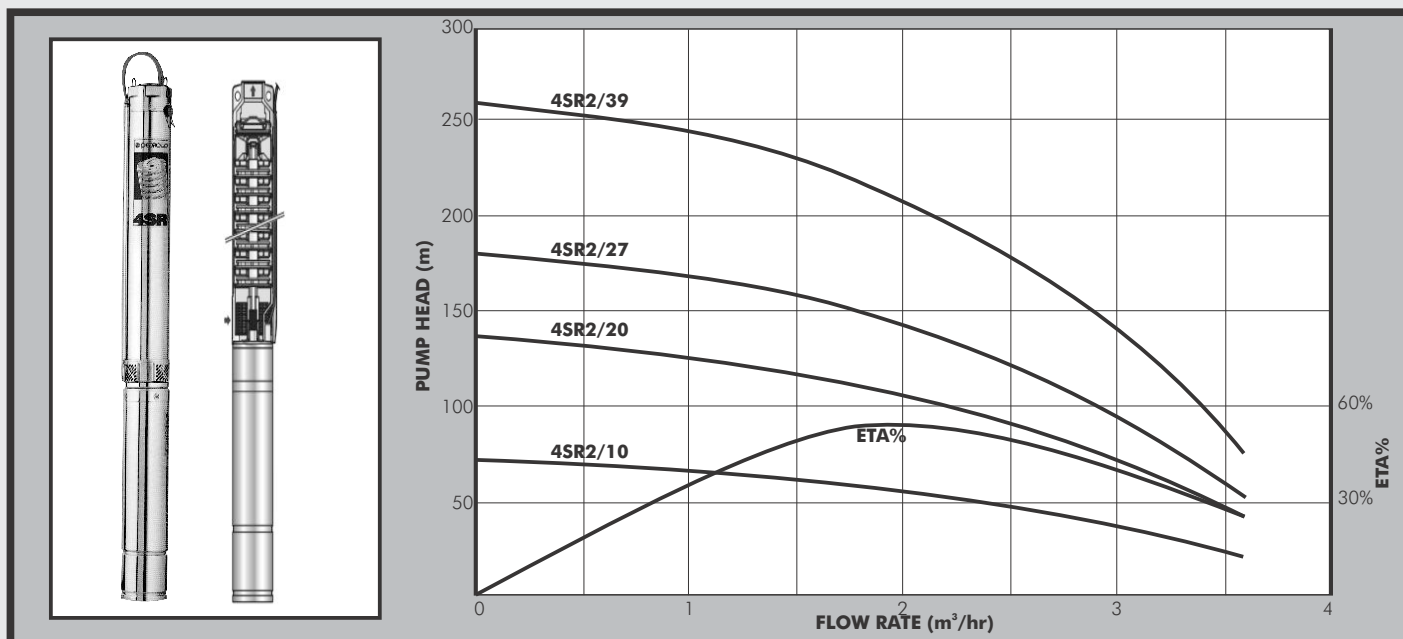
**Min. Borehole Diameter:** 110mm

**Max. Immersion Depth:** 100m

### PUMP DATA

Model	Power (kW)	Current (A)		DN (")	Dimensions (mm)		Weight (kg)
		1x240V	3x415V		H1	H2	
4SR1/13	0.37	2.2		1 1/4	400	311	11
4SR1/18	0.55	3.4			517	331	13
4SR1/25	0.75	4.1			646	356	16
4SR1/45	1.5	8.1	4.8		1065	436	24





### PUMP

Pedrollo 4SR2 submersible pumps are specifically designed for domestic and small scale water supply from boreholes, though can also be used in other submersible applications in either vertical or horizontal configuration. They feature a hydraulic design that incorporates floating impellers which together with especially resistant component materials provide high resistance to sand content in the pumped water.

The pump impellers and diffusers are made from technopolymer while the stage casings, top housing, suction connector, pump sleeve and shaft are made of AISI 304 stainless steel. The pump is supplied with a 1.5m tail cable.

### MOTOR

Pumps are coupled to a two pole sealed oil filled motor constructed principally from AISI 316 stainless steel. A separate control box is recommended for single phase pumps which incorporates a fused rotary switch, run indicator light, DOL starter and capacitor which can be connected directly to the mains power supply. 3 phase motors require a remote starter and if irregular electrical supply is prevalent an additional quick tripping voltage sensing relay is recommended.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900rpm

### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non aggressive liquids with a maximum sand content of 150gm/m³.

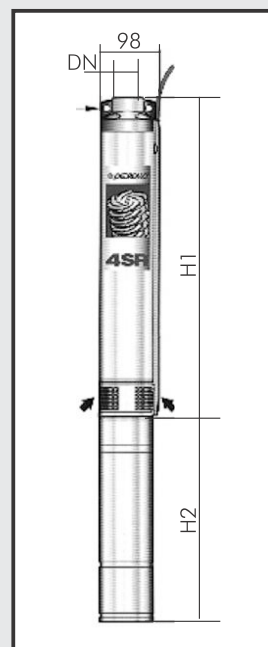
**Max. Liquid Temperature:** +30°C.

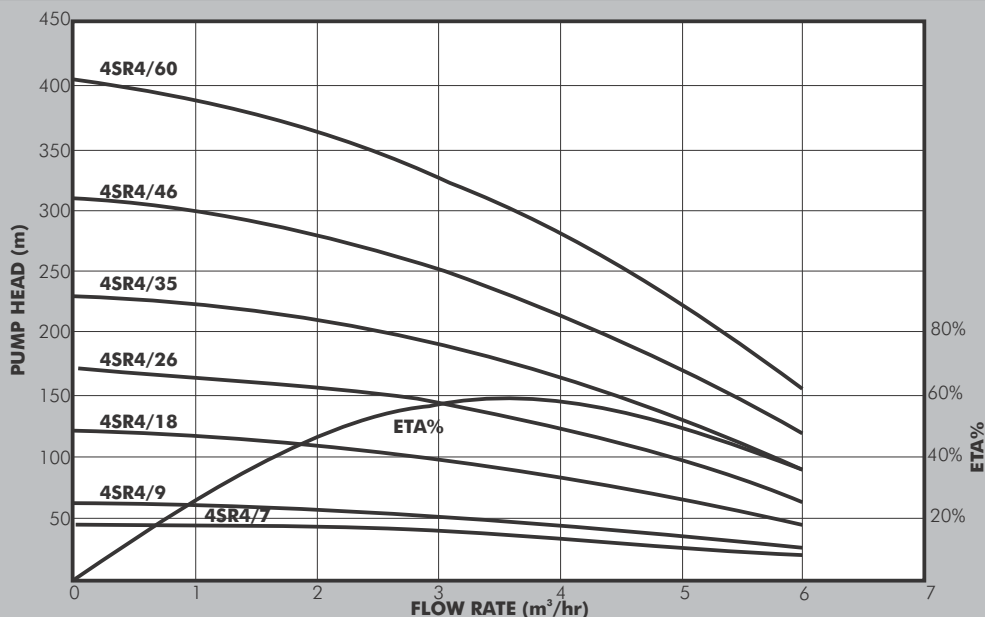
**Min. Borehole Diameter:** 110mm

**Max. Immersion Depth:** 100m

### PUMP DATA

Model	Power (kW)	Current (A)		DN (")	Dimensions (mm)		Weight (kg)
		1x240V	3x415V		H1	H2	
4SR2/10	0.55	3.4		1 1/4	345	331	12
4SR2/20	1.1	5.9	3.4		554	371	16
4SR2/27	1.5	8.1	4.8		683	396	18
4SR2/39	2.2	10.6	6.1		929	437	22





### PUMP

Pedrollo 4SR4 submersible pumps are specifically designed for domestic and small scale water supply from boreholes, though can also be used in other submersible applications in either vertical or horizontal configuration. They feature a hydraulic design that incorporates floating impellers which together with especially resistant component materials provide high resistance to sand content in the pumped water.

The pump impellers and diffusers are made from engineering plastic while the stage casings, top housing, suction connector, pump sleeve and shaft are made of AISI 304 stainless steel. The pump is supplied with a 1.5m tail cable.

### MOTOR

Pumps are coupled to a two pole sealed oil filled motor constructed principally from AISI 316 stainless steel. A separate control box is recommended for single phase pumps which incorporates a fused rotary switch, run indicator light, DOL starter and capacitor which can be connected directly to the mains power supply. 3 phase motors require a remote starter and if irregular electrical supply is prevalent an additional quick tripping voltage sensing relay is recommended.

**Enclosure Class:** IP68

**Insulation Class:** F

**Speed:** 2900rpm

### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non aggressive liquids with a maximum sand content of 150gm/m<sup>3</sup>.

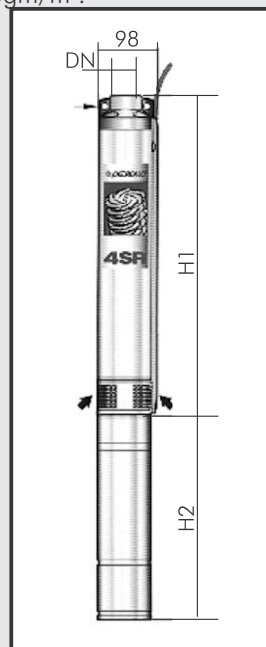
**Max. Liquid Temperature:** +30°C.

**Min. Borehole Diameter:** 110mm

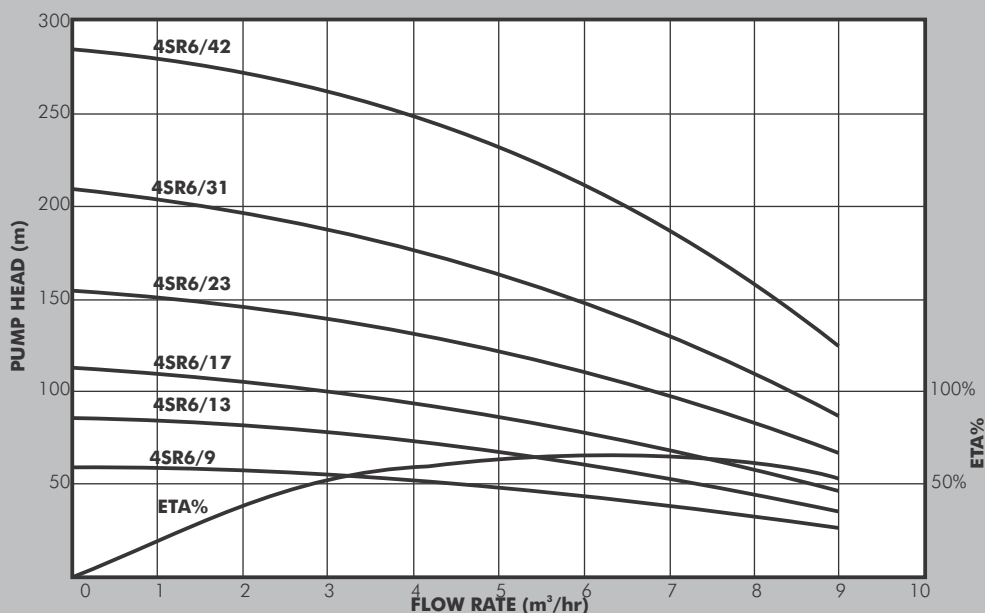
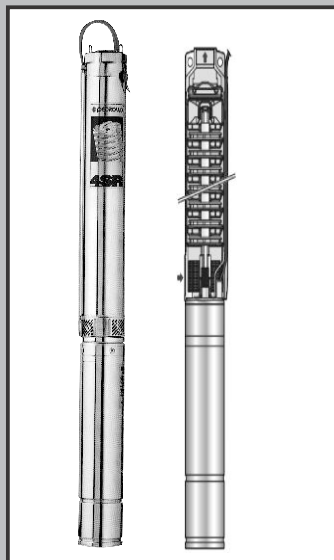
**Max. Immersion Depth:** 100m

### PUMP DATA

Model	Power (kW)	Current (A)		DN (")	Dimensions (mm)		Weight (kg)
		1x240V	3x415V		H1	H2	
4SR4/7	0.55	3.4		1 1/4	314	331	11
4SR4/9	0.75	4.1			358	356	13
4SR4/18	1.5	8.1	4.8		580	396	17
4SR4/26	2.2	10.6	6.1		756	437	20
4SR4/35	3		7.1		978	450	24
4SR4/46	4		9.2		1295	505	31
4SR4/60	5.5		13.3		1652	700	44







### PUMP

Pedrollo 4SR6 submersible pumps are specifically designed for domestic and small scale water supply from boreholes, though can also be used in other submersible applications in either vertical or horizontal configuration. They feature a hydraulic design that incorporates floating impellers which together with especially resistant component materials provide high resistance to sand content in the pumped water.

The pump impellers and diffusers are made from technopolymer while the stage casings, top housing, suction connector, pump sleeve and shaft are made of AISI 304 stainless steel. The pump is supplied with a 1.5m tail cable.

### MOTOR

Pumps are coupled to a two pole sealed motor constructed principally from stainless steel. A separate control box is also included for single phase pumps which incorporates a fused rotary switch, run indicator light, thermal overload with manual reset and capacitor which can be connected directly to the mains power supply. 3 phase motors require a remote direct on-line starter and if irregular electrical supply is prevalent an additional quick tripping voltage sensing relay is recommended.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900rpm

### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non aggressive liquids with a maximum sand content of 150gm/m<sup>3</sup>.

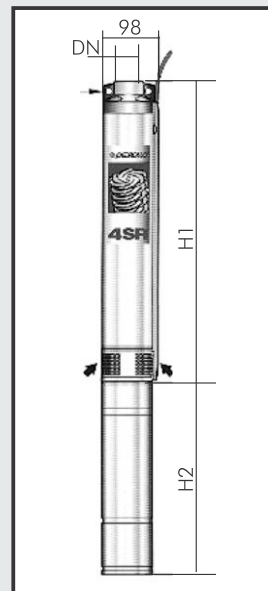
**Max. Liquid Temperature:** +30°C.

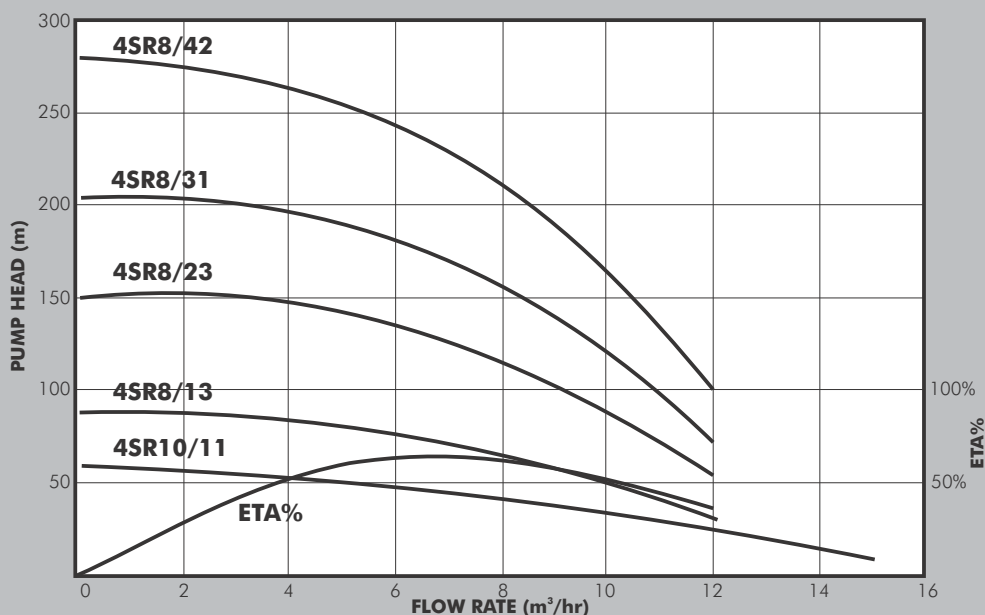
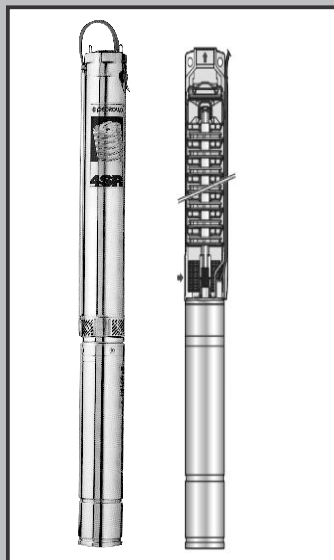
**Min. Borehole Diameter:** 110mm

**Max. Immersion Depth:** 100m

### PUMP DATA

Model	Motor		Current (A)		DN (")	Dimensions(mm)		Weight (kg)
	kW	HP	1x240V	3x415V		H1	H2	
4SR6/9	1.1	1.5	5.9	3.4	2	431	371	15
4SR6/13	1.5	2	8.1	4.8		576	396	17
4SR6/17	2.2	3	10.6	6.1		695	437	19
4SR6/23	3	4		7.1		900	450	23
4SR6/31	4.0	5.5		9.2		1166	583	28
4SR6/42	5.5	7.5		13.3		1520	700	41





## PUMP

Pedrollo 4SR8/10 submersible pumps are specifically designed for domestic and small scale water supply from boreholes, though can also be used in other submersible applications in either vertical or horizontal configuration. They feature a hydraulic design that incorporates floating impellers which together with especially resistant component materials provide high resistance to sand content in the pumped water.

The pump impellers and diffusers are made from technopolymer while the stage casings, top housing, suction connector, pump sleeve and shaft are made of AISI 304 stainless steel. The pump is supplied with a 1.5m tail cable.

## MOTOR

Pumps are coupled to a two pole sealed motor constructed principally from stainless steel. A separate control box is also included for single phase pumps which incorporates a fused rotary switch, run indicator light, thermal overload with manual reset and capacitor which can be connected directly to the mains power supply. 3 phase motors require a remote direct on-line starter and if irregular electrical supply is prevalent an additional quick tripping voltage sensing relay is recommended.

**Enclosure Class :** IP68

**Insulation Class:** F

**Voltage:** 3x415V

**Speed:** 2900rpm

## OPERATING CONDITIONS

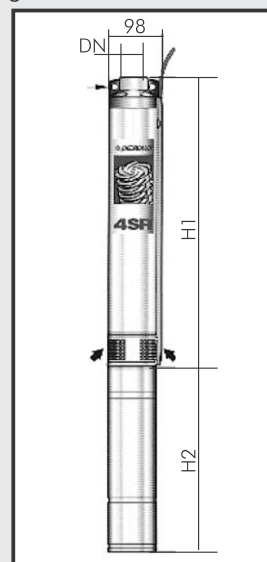
**Pumped Liquid:** Thin, clean, chemically non aggressive liquids with a maximum sand content of 150gm/m<sup>3</sup>.

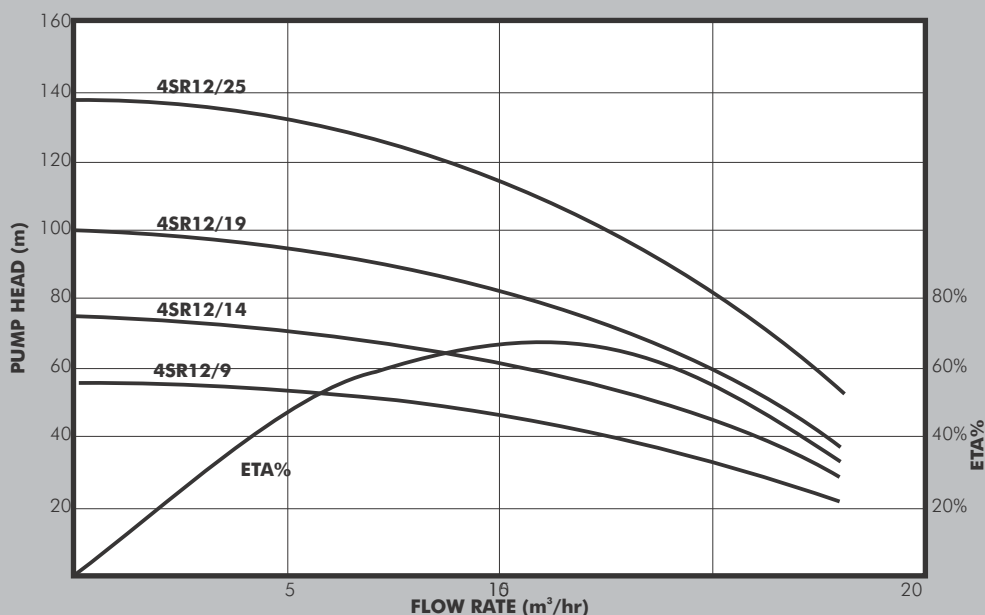
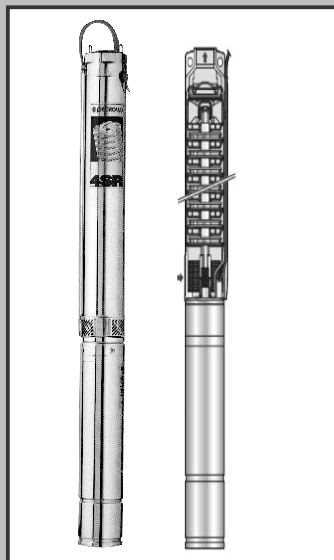
**Max. Liquid Temperature:** +30°C.

**Min. Borehole Diameter:** 110 mm

## PUMP DATA

Model	Motor		Current (A)	DN (")	Dimensions(mm)		Weight (kg)
	kW	HP			H1	H2	
4SR8/13	2.2	3.0	10.6	2	576	437	19
4SR8/23	4.0	5.5	9.2		901	505	25
4SR8/31	5.5	7.5	13.3		1165	700	37
4SR8/42	7.5	10.0	16.4		1519	800	44
4SR10/11	1.5	2	4.8		981	396	19





### PUMP

Pedrollo 4SR12 submersible pumps are specifically designed for domestic and small scale water supply from boreholes, though can also be used in other submersible applications in either vertical or horizontal configuration. They feature a hydraulic design that incorporates floating impellers which together with especially resistant component materials provide high resistance to sand content in the pumped water.

The pump impellers and diffusers are made from technopolymer while the stage casings, top housing, suction connector, pump sleeve and shaft are made of AISI 304 stainless steel. The pump is supplied with a 1.5m tail cable.

### MOTOR

Pumps are coupled to a two pole sealed motor constructed principally from stainless steel. A separate control box is also included for single phase pumps which incorporates a fused rotary switch, run indicator light, thermal overload with manual reset and capacitor which can be connected directly to the mains power supply. 3 phase motors require a remote direct in-line starter and if irregular electrical supply is prevalent an additional quick tripping voltage sensing relay is recommended.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900rpm

### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non aggressive liquids with a maximum sand content of 150gm/m<sup>3</sup>.

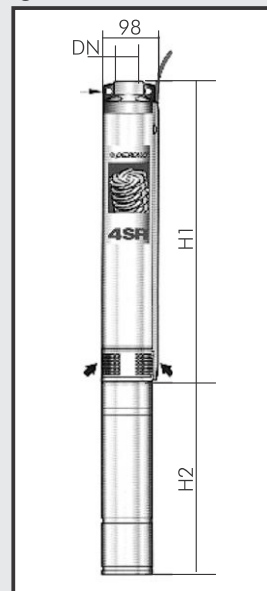
**Max. Liquid Temperature:** +30°C.

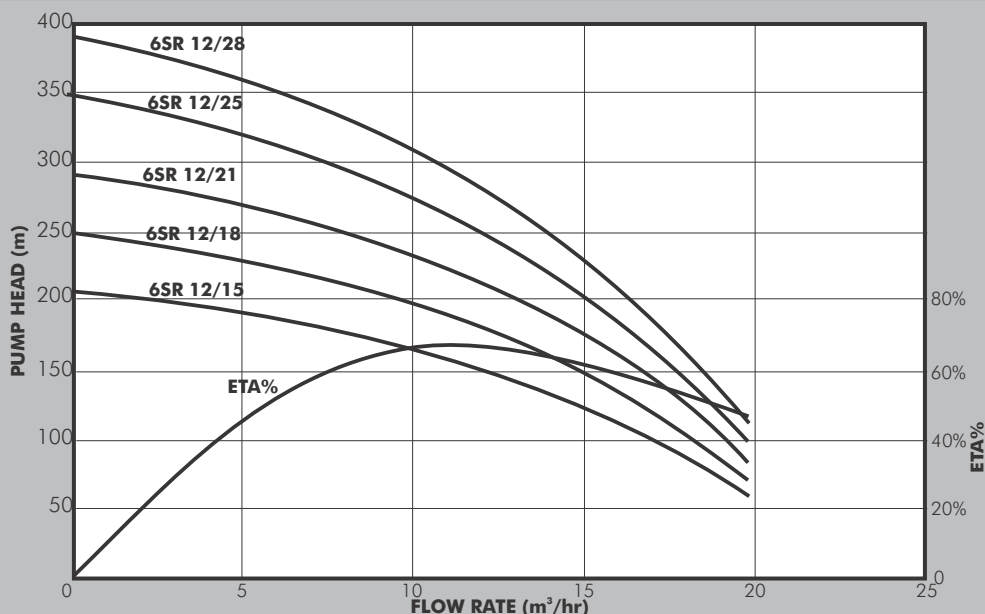
**Min. Borehole Diameter:** 110 mm

**Max. Immersion Depth:** 100m

### PUMP DATA

Model	Motor		Current (A)		DN (")	Dimensions(mm)		Weight (kg)
	kW	HP	1x240V	3x415V		H1	H2	
4SR12/9	1.5	2	8.1	4.8	2	835	396	18
4SR12/14	2.2	3	10.6	6.1		1200	437	22
4SR12/19	3	4		7.1		1565	450	27
4SR12/25	4	5.5		9.2		2003	505	33





## PUMP

Pedrollo 6SR12 submersible pumps are specifically designed for supply from boreholes, though can also be used in other submersible applications in either vertical or horizontal configuration. They feature a hydraulic design that incorporates floating impellers which together with especially resistant component materials provide high resistance to sand content in the pumped water.

The pump impellers and diffusers are made from technopolymer while the stage casings, top housing, suction connector, pump sleeve and shaft are made of AISI 304 stainless steel. The pump is supplied with a 4m tail cable.

## MOTOR

Pumps are coupled to a two pole sealed motor constructed principally from stainless steel. Motors require a remote direct in-line starter and if irregular electrical supply is prevalent an additional quick tripping multi function protection relay is recommended.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900rpm

**Voltage:** 3x415V

## OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non aggressive liquids with a maximum sand content of 100gm/m<sup>3</sup>.

**Max. Liquid Temperature:** +35°C

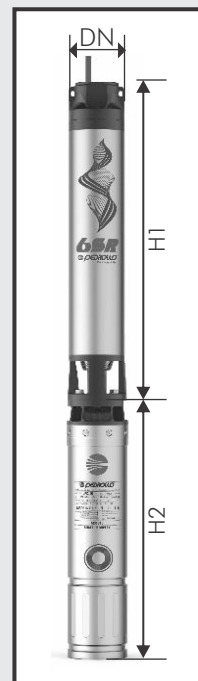
**Max. Immersion Depth:** 100m

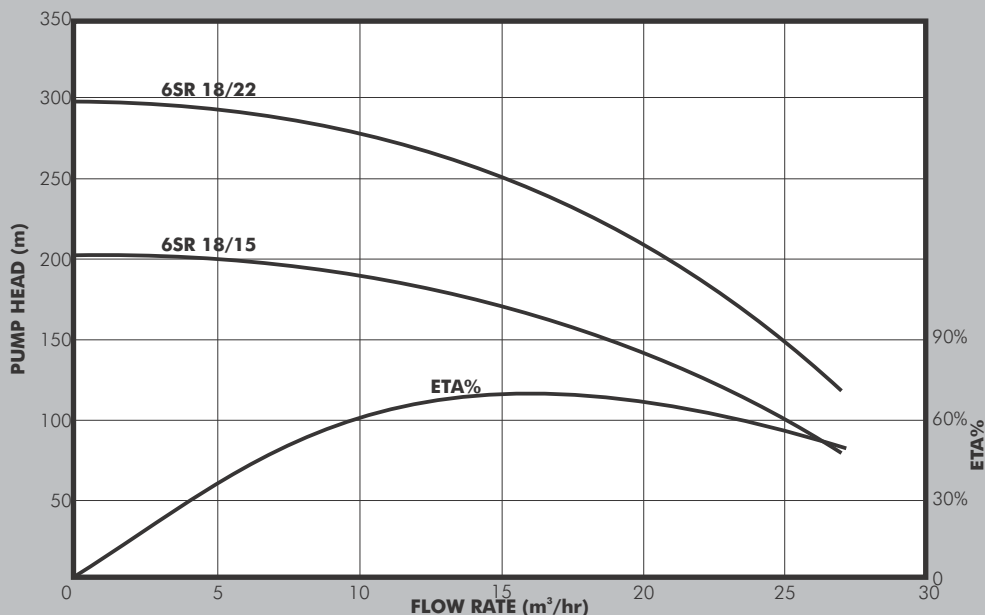
**Min. Borehole Diameter:** 300mm

**Max. Immersion Depth:** 100m

## PUMP DATA

Model	Motor		Current (A)	DN (")	Dimensions(mm)		Weight (Kg)
	kW	HP			H1	H2	
6SR12/15	7.5	10	16.8	3	1068	698	67
6SR12/18	9.2	12.5	20.9		1198	731	73
6SR12/21	11	15	25.3		1328	826	84
6SR12/25	15	20	33.4		1502	894	96
6SR12/28					1632		98





## PUMP

Pedrollo 6SR18 submersible pumps are specifically designed for supply from boreholes, though can also be used in other submersible applications in either vertical or horizontal configuration. They feature a hydraulic design that incorporates floating impellers which together with especially resistant component materials provide high resistance to sand content in the pumped water.

The pump impellers and diffusers are made from technopolymer while the stage casings, top housing, suction connector, pump sleeve and shaft are made of AISI 304 stainless steel. The pump is supplied with a 4m tail cable.

## MOTOR

Pumps are coupled to a two pole sealed motor constructed principally from stainless steel. Motors require a remote direct in-line starter and if irregular electrical supply is prevalent an additional quick tripping multi function protection relay is recommended.

**Enclosure Class :** IP68

**Insulation Class:** F

**Speed:** 2900rpm

**Voltage:** 3x415V

## OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non aggressive liquids with a maximum sand content of 100gm/m<sup>3</sup>.

**Max. Liquid Temperature:** +35°C

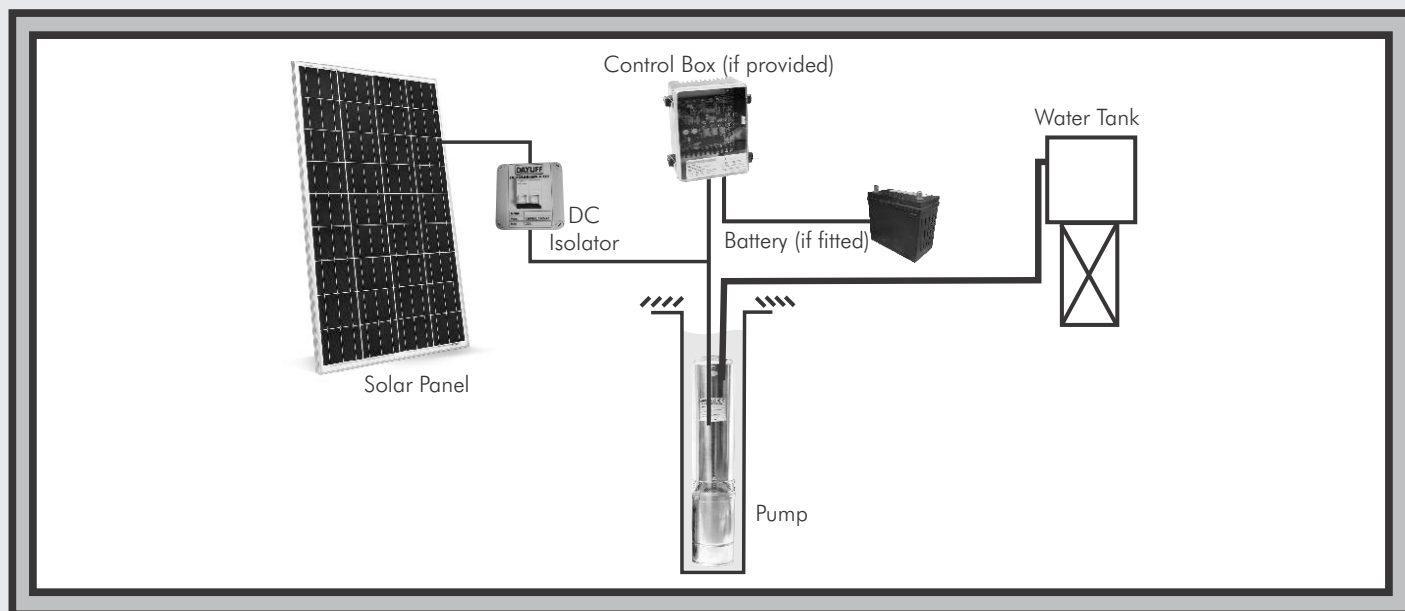
**Max. Immersion Depth:** 300m

**Min. Borehole Diameter:** 200mm

## PUMP DATA

Model	Motor		Current (A)	DN (")	Dimensions(mm)		Weight (Kg)
	kW	HP			H1	H2	
6SR18/15	15	20	33.4	3	1068	894	85
6SR18/22	18.5	25	40.7		1371	959	100





Solar pumping is now firmly established as the technology for water supply in remote off-grid applications and also as the costs reduce increasingly for general pumping duties. Dayliff have been leaders in the technology since the birth of the industry and today offer a wide range of options for every solar pumping requirement imaginable. Particularly a range of competitive, high specification solar pumping systems have been developed for smaller scale applications which are based on robust submersible solar pumps specially designed for PV powered water supply from wells and boreholes.

Together with the pump all systems include:-

- The appropriate specifications and number of Grade 1 PV modules with connectors for simplified installation
- Submersible drop cable and joint together with 10m module connection cable
- DC solar isolator with MCB control provided for module isolation
- Safety rope and HDPE pipe connectors

Module supports and piping are not included. The various systems offered give a wide range of duties, indicative performance being given. Full details of pump performance and specification is given in the Dayliff Product Manual and should be referred to when selecting equipment.

SUNFLO-S	SUNFLO-A	SUNFLO-B
<p>Positive displacement type of three chamber diaphragm design. They are manufactured from high quality engineering plastics with plastic casings for the 150 model and stainless steel for the 300. Pumps can be connected directly to a 24V PV power supply for daytime only pumping or through a charge controller connected to batteries for extended daily operation.</p>	<p>All models are of helical rotary screw stainless steel design for high efficiency and feature an inbuilt controller that gives operating protection for direct connection to the PV modules. All models are of narrow 3" diameter specifically designed for boreholes.</p>	<p>Higher specification pumps of both helical rotor and centrifugal type that are provided with separate controllers that technology to maximise output as well as electrical protection and giving operating status. connection is also extended daily feature MPPT pumping providing indicator lights Battery available for pumping.</p>

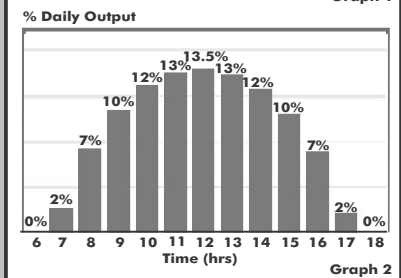
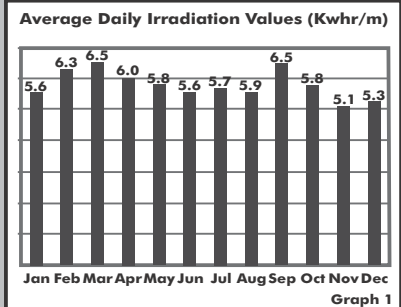
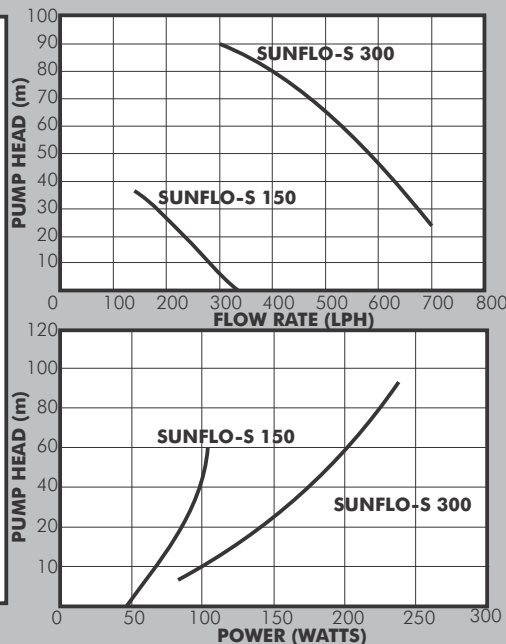
### System Options

Pump Model	Indicative Performance	Input Voltage (V)	Motor Rating Watts	Peak Voltage (V)	Open Circuit Voltage (VoC)	PV Modules	Cable length, 2.5mm <sup>2</sup>	Outlet Size
SUNFLO-S 150	1m <sup>3</sup> /day at 30m	24	120	24	<50	1x200W	30m	1/2"
SUNFLO-S 300	3m <sup>3</sup> /day at 60m	24	300	24		2x200W	60m	3/4"
SUNFLO-A 150H	2m <sup>3</sup> /day at 30m	24	150	≥30	<100	1x200W	30m	
SUNFLO-A 270H	3m <sup>3</sup> /day at 50m	36	270	≥45		2x200W	50m	
SUNFLO-A 600H	4m <sup>3</sup> /day at 70m	48	600	≥60	<100	4x200W	70m	
SUNFLO-B 120H	3m <sup>3</sup> /day at 30m	24	120	≥30	<50	1x200W	30m	1"
SUNFLO-B 500C	6m <sup>3</sup> /day at 40m	48	500	≥60	<100	4x200W	40m	
SUNFLO-B 1000C	12m <sup>3</sup> /day at 70m	110	1000	≥112	<200	8x200W	70m	

Note1: Greater water outputs will be available at lower heads

Note2: Actual performance will be determined by site conditions and irradiation levels.





## PUMP

DAYLIFF SUNFLO-S series submersible pumps are designed for reliable small-scale water supply from boreholes and wells and are the ideal solution for remote pumping requirements in livestock watering, irrigation and general water supply applications. They are of positive displacement three-chamber diaphragm design and can run dry without damage. An internal bypass is also incorporated to prevent pump damage in the event of delivery cut-off.

Pump components are manufactured from high quality engineering plastics with santoprene used for the diaphragm and EPDM for the valves. Pump casings are plastic for 150 and stainless steel for 300 and a 50-mesh stainless steel screen is also incorporated.

Pumps can be installed either with a direct connection to the PV module or through a charge controller that is connected to a battery for 24hr operation.

## PUMP OUTPUTS

Performance curves are given at standard test conditions of 1000W/m<sup>2</sup> solar irradiance and 25°C. Output will vary throughout the year depending upon prevailing irradiation levels. For estimated daily outputs at continuous pumping multiply the indicated output at the duty point by the daily irradiation given in Graph 1. For indicative purposes factors of 1.1 can be applied for hot arid areas and 0.9 for temperate high altitude areas in the Tropics. Output will vary throughout the day as a proportion of the estimated hourly irradiation as shown in Graph 2.

## MOTOR

The pump motor is of permanent magnet type for 24V DC power input from either a direct source or photovoltaic modules. Internal thermal protection is also provided.

## OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids without solid particles.

**Max. Liquid Temperature:** +77°C

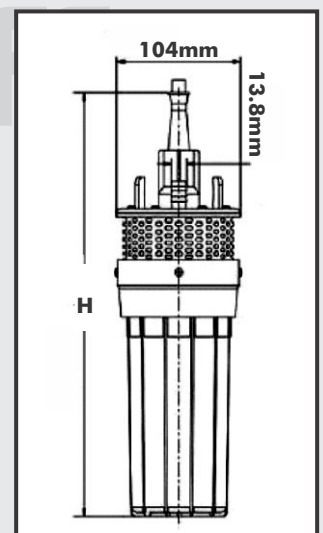
**Ambient Temperature:** -40°C-+60°C

**Max. Immersion Depth:** 30m

**Internal by-pass Pressure:** 7.5bar

## PUMP DATA

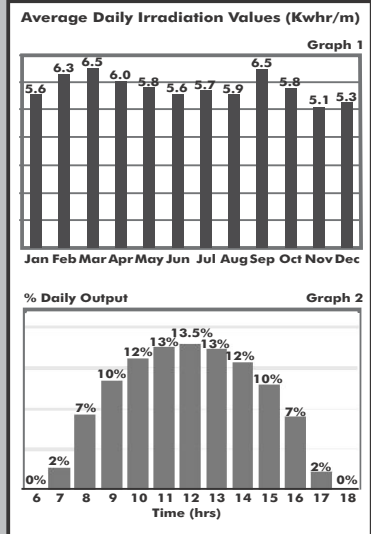
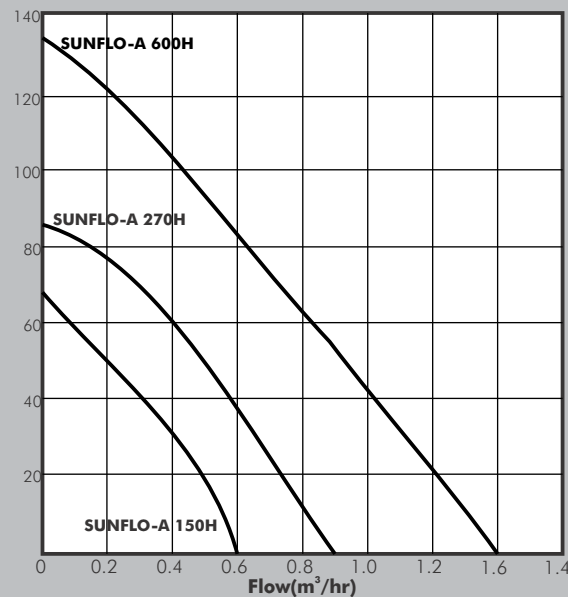
Model	Power (W)	Input Power (W)	Voltage (VDC)	Current (A)	Outlet (")	Height L(mm)	Weight (kg)
SUNFLO-S 150	120	150	24	4	½	329	2.7
SUNFLO-S 300	300	375	24	5	¾	335	3





# SUNFLO-A

## DC Solar Submersible Pump



### PUMP

DAYLIFF SUNFLO-A pumps are specifically designed for PV solar powered water supply from wells and boreholes. They are of rotary screw design and material of construction for rotary screw is stainless steel with a rubber stator. Pumps are of simple structure and features an inbuilt controller.

### MOTOR

Permanent magnet, oil filled, brushless, DC motor specifically designed for maximum efficiency from solar module power source. It should be powered by solar array configured to provide the input voltage and sized at approximately 130% of the rated motor power.

### PUMP OUTPUTS

Performance curves are given at standard test conditions of 1000W/m² solar irradiance and 25°C. Output will vary throughout the year depending upon prevailing irradiation levels. For estimated daily outputs at continuous pumping, multiply the indicated output at the duty point by the daily irradiation given in Graph 1. For indicative purposes, factors of 1.1 can be applied for hot arid areas and 0.9 for temperature high altitude areas in the Tropics. Output will vary throughout the day as a proportion of the estimated hourly irradiation as shown in Graph 2.

**Enclosure Class:** IP68

**Insulation Class:** B

**Speed:** 2900rpm

### OPERATING PARAMETERS

**Pumped liquid:** Thin, clean, chemically non-aggressive liquids with a sand content of less than 0.1%.

**Max. Liquid Temperature:** +40°C

**Ambient Temperature:** -20°C - +50°C

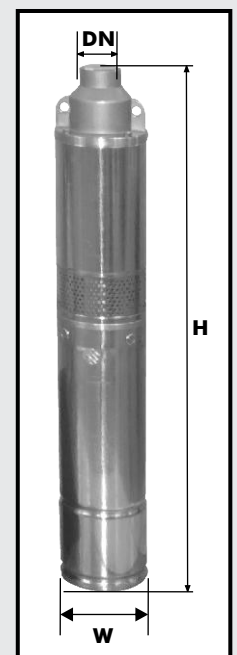
**Min. Immersion Depth:** 0.5m

**Max Immersion Depth:** 20m

**Min. Borehole Diameter:** 125mm

### PUMP DATA

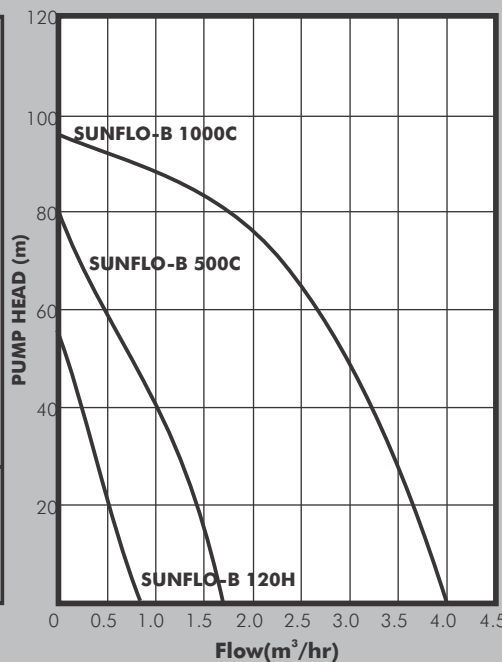
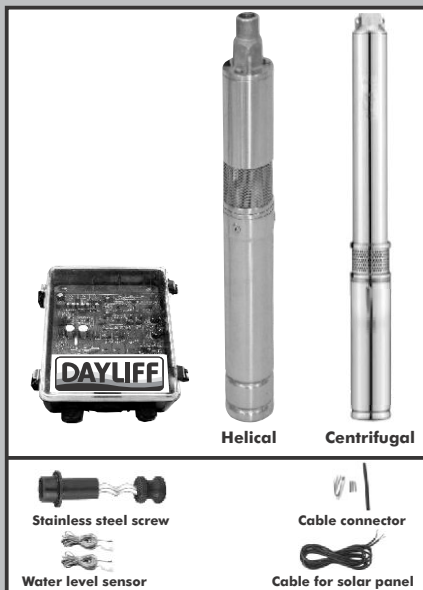
Model	Input Voltage (V)	Motor Rating (W)	Input Power (W)	Peak Voltage (V)	Open Circuit Voltage (VOC)	DN (")	Dimensions (mm)		Weight (kg)
							H	W	
SUNFLO-A 150H	24	150	200	≥30	<50	¾	680	76	7
SUNFLO-A 270H	36	270	350	≥45	<100		860		7
SUNFLO-A 600H	48	600	780	≥60	<100		1350		8



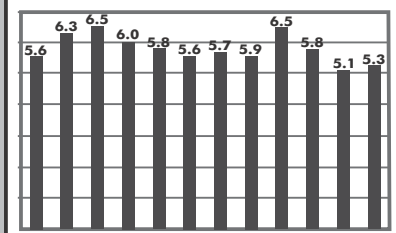


# SUNFLO-B

## DC Solar Submersible Pump

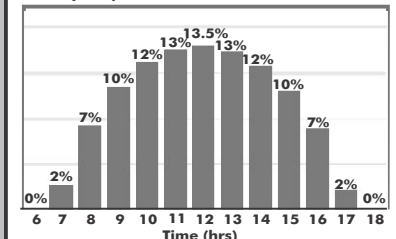


Average Daily Irradiation Values (Kwhr/m)



Graph 1

% Daily Output



Graph 2

### PUMP

DAYLIFF SUNFLO-B pumps are specifically designed for PV solar powered water supply from wells and boreholes. They are of centrifugal and rotary screw design and material of construction for rotary screw design are principally stainless steel with a rubber stator while centrifugal design features noryl impellers and stainless steel chambers. Pumps are supplied complete with a controller, cable connectors, water level sensor, solar PV connecting cables and spare rotor for helical type.

### MOTOR

Permanent magnet, oil filled, brushless, DC motor specifically designed for maximum efficiency from solar module power sources. It should be powered by solar array configured to provide the input voltage required and sized at approximately 130% of the rated motor power.

**Enclosure Class:** IP68

**Insulation Class:** B

**Speed:** 2900rpm

### CONTROLLER

The pump is supplied with a self-contained multifunction MPPT (Maximum Power Point Tracking) controller that tracks the solar module's maximum power output voltage which varies with module temperature and irradiation levels. This ensures maximum current output, typically +25% higher than conventional module controllers and a similar increase in daily water output. The controller also protects from over and under voltage, over current and low water level (if electrodes are fitted) and features various indicator lights that give the pump's operating status. The system can be installed either with or without batteries. If batteries are included, the pump will operate when there is insufficient solar irradiation for direct power.

### PUMP OUTPUTS

Performance curves are given at standard test conditions of 1000W/m<sup>2</sup> solar irradiance and 25°C. Output will vary throughout the year depending upon prevailing irradiation levels. For estimated daily outputs at continuous pumping, multiply the indicated output at the duty point by the daily irradiation given in Graph 1. For indicative purposes, factors of 1.1 can be applied for hot arid areas and 0.9 for temperate high altitude areas in the Tropics. Output will vary throughout the day as a proportion of the estimated hourly irradiation as shown in Graph 2.

### OPERATING PARAMETERS

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids with a sand content of less than 0.1%.

**Ambient Temperature:** -20°C - +50°C

**Maximum Liquid Temperature:** +40°C

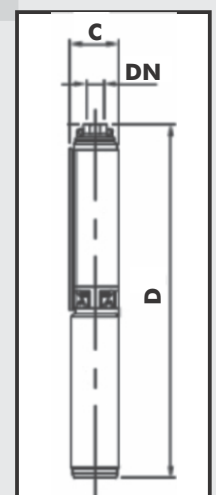
**Minimum Immersion Depth:** 0.5m

**Maximum Immersion Depth:** 20m

**Minimum Borehole Diameter:** 125mm

### PUMP DATA

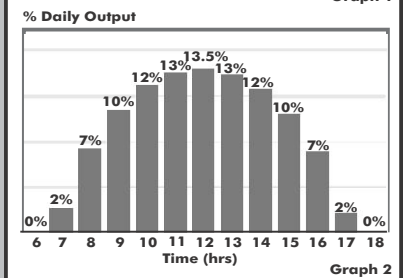
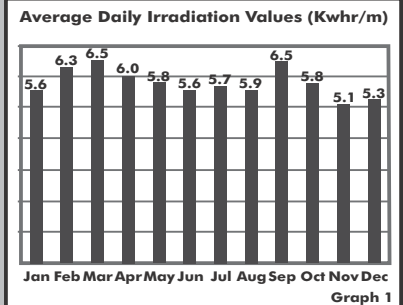
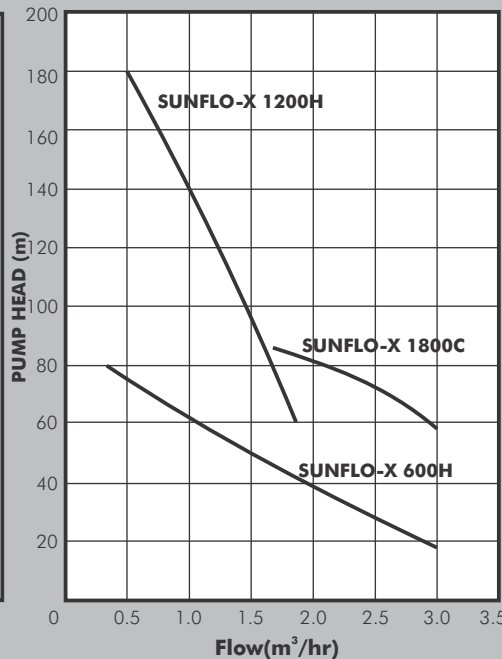
Model	Type	Input Voltage (V)	Motor Rating (W)	Max Input Voltage (V)	Input Power (W)	Peak Voltage (V)	Open Circuit Voltage (VOC)	DN (")	Dimensions (mm)		Wt (kg)
									C	D	
SUNFLO-B 120H	Helical Rotor	24	120	50	160	≥30	<50	¾"	76	820	12
SUNFLO-B 500C	Centrifugal	48	500	100	680	≥60	<100	1"	76	1020	17
SUNFLO-B 1000C	Centrifugal	100	1000	200	1400	≥112	<200	1¼"	100	860	21





# SUNFLO-X

## DC Solar Submersible Pump



### PUMP

DAYLIFF SUNFLO-X Range of pumps are high specification solar powered centrifugal and helical rotor DC pumps specifically designed for borehole applications and feature a remote surface mounted controller. Pumps are constructed principally from AISI 304 stainless steel and are engineered to the highest standards to give serviceability, excellent efficiency, high reliability and long life. Helical rotor type are supplied with spare rotor.

### MOTOR

Pumps are fitted with Permanent Magnet brushless high efficiency, maintenance free DC motors without integrated electronics specifically designed for maximum efficiency. They should be powered by solar arrays configured to provide the input voltage required and sized at approximately 130% of the rated motor power.

**Insulation Class:** F

**Enclosure Class:** IP68

**Speed:** 3300rpm

### CONTROLLER

Pumps are provided with matched controllers for monitoring, protecting and controlling pump operations with the following features:-

- Protection against reverse polarity, overload and over temperature.
- Integrated MPPT (Maximum Power Point Tracking) with 99% energy conversion efficiency to maximize module power output.
- Fully automatic operation and complete protection including low level control, dry running and over/under voltage.
- Enhanced pump start on low sun intensity.
- Easy trouble shooting, where fault code is displayed on LCD screen for fast identification and problem solving.
- Enclosure Class: Ip52

### PUMP OUTPUTS

Performance curves are given at standard test conditions of 1000W/m² solar irradiance and 25°C. Output will vary throughout the year depending upon prevailing irradiation levels. For estimated daily outputs at continuous pumping multiply the indicated output at the duty point by the daily irradiation given in Graph 1. For indicative purposes factors of 1.1 can be applied for hot arid areas and 0.9 for temperate high altitude areas in the Tropics. Output will vary throughout the day as a proportion of the estimated hourly irradiation as shown in Graph 2.

### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids with a sand content of less than 0.1%.

**Maximum Liquid Temperature:** 0-35°C

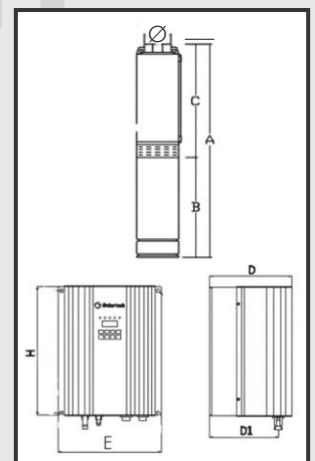
**Controller Ambient Temperature:** -20°C to +60°C

**Max Immersion Depth:** 250m

**Minimum Borehole Diameter:** 125mm

### PUMP DATA

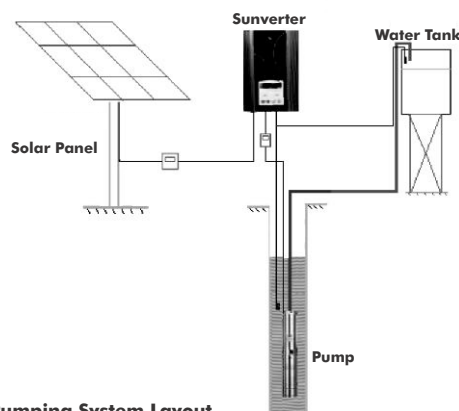
Model	Type	Power			Required MPP Voltage	Dimensions (mm)								Weight (kg)
		kW	Max Current (A)	Max Voltage (VDC)		A	B	C	D	D1	Ø	E	H	
SUNFLO-X 600H	Helical Rotor	0.6	15	150	60-120VDC	560	351	209	146	113	32	202	244	16
SUNFLO-X 1200H	Helical Rotor	1.2	15	200	120-160VDC	600	358	242	146	113	32	202	284	20
SUNFLO-X 1800C	Centrifugal	1.8	15	200	120-160VDC	1040	389	651	146	113	40	202	284	24





# SUNVERTER<sup>1</sup>

## AC Solar Pump Controllers



Solar Water Pumping System Layout

### SUNVERTER CONTROLLERS

Recent innovations in DC/AC inverter technology have led to the development of solar solutions for large system outputs, which use standard AC motors controlled by specially designed inverters. Dayliff Sunverter systems are specifically designed for large system outputs using Dayliff DS submersible pumps or equivalent AC type submersible systems. Specific features include:-

- Suitable for all 3 phase AC induction motors upto 18.5kW. Larger sizes available on request.
- Designed for all Grundfos/Dayliff pump models and can be retro fitted to existing installations.
- MPPT features that optimise output frequency to give maximum system efficiency.
- Intelligent power module used in the main circuit with high reliability and 98% conversion efficiency.
- Fully automatic operation, free setting speed range based on actual situation of the system.
- Storage capacity for 8yrs operational data.
- Full motor protection functions, optional water level detecting and control circuit for overflow and idle running prevention.
- Attractive aluminum alloy case with enhanced cooling capability.

### CONTROLLER FUNCTIONS

The controller offers the following control functions:-

- Settable minimum and maximum frequency and open circuit voltage.
- Display of operating parameters including frequency, voltage, amperage, input power and pump speed.
- Display of historical data including energy generation, maximum power and operating times.
- Protection against over and under voltage, over current, system overload and module over temperature.
- Fault detection with error code display.

### INSTALLATION

Dayliff Sunverter controllers are surface mounted and should be provided with a housing for water and heat protection. They must also be provided with a circuit breaker between the PV modules and controller. Due to the high operating voltages proper earthing is essential, which must be done by a qualified electrician. As a rule all PV powered solar pumping systems should be provided with a solar module array with a nominal output about 30% greater than the motor size. The arrays should be wired in a combination of series and parallel connections to ensure that the correct voltage is available in to the inverter. It is important that the connection arrangement is approved by the pump supplier.

**Enclosure Class:** IP52

**Ambient Temperature:** -10°C to +50°C

**Rated Voltage:** 3x415V

### OPERATING CONDITIONS

**Max DC Input Voltage:** 750VDC

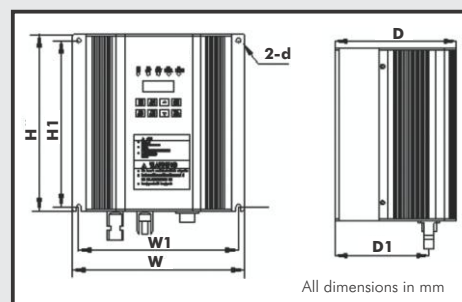
**MPP Voltage:** 500-600VDC

**Frequency:** 0-60Hz

**Relative Humidity:** 0-95%

### CONTROLLER DATA

MODEL	Motor Rated Power (kW)	Max Solar Input Power (kWp)	Output Current (A)	Dimensions (mm)							Weight (kg)
				W	H	D	W1	H1	D1	d	
SV1/3.7T	3.7	5.0	9	250	310	200	235	295	167	7.0	9.5
SV1/5.5T	5.5	8.0	13								9.6
SV1/7.5T	7.5	11	18								10
SV1/11T	11	16	24								10.5
SV1/15T	15	22	30								10.7
SV1/18T	18.5	28	39								10.7

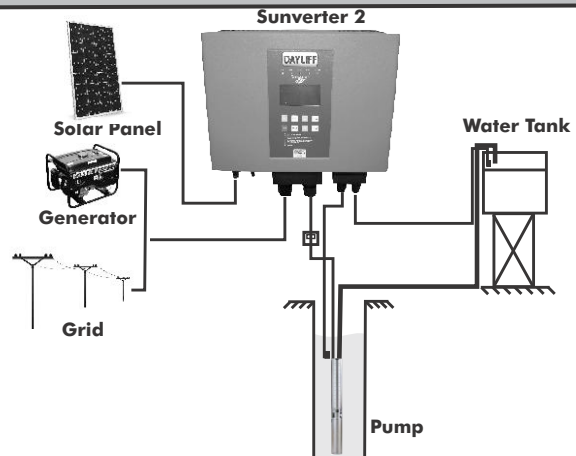


All dimensions in mm



# SUNVERTER 2

## AC Solar Pump Controllers



Dayliff Sunverter 2 is an advanced AC/DC inverter specially designed for solar powering AC motors in various water pumping applications. A particular feature is hybrid capability that enables for the connection of direct AC power from mains or generator supply. It is adaptable to all AC motor types and can be retro fitted to the solarisation of existing AC supply installations. Particular features include;

- Patented MPPT (Maximum Power Point Tracking) capability providing fast response, good stability and up to 99% efficiency.
- Fully automatic operation with up to 8 years storage capacity of operating data.
- Supports motor soft start and gives full motor protection
- User friendly LCD display interface with comprehensive display information
- Hybrid capability with the option of DC solar power, generator or mains grid power inputs
- Remote monitoring and control capability using the unique iDayliff GPRS interface
- Strong IP65 rated enclosure for enhanced component protection

### CONTROLLER FUNCTIONALITY

The controller offers the following control functions:-

- Settable minimum and maximum frequency and open circuit voltage.
- Display of operating parameters including frequency, voltage, amperage, input power and pump speed.
- Display of historical data including energy generation, maximum power and operating times.
- Protection against over and under voltage, over current, system overload and module over temperature.
- Fault detection with error code display.

### INSTALLATION

Dayliff Sunverter 2 controllers are surface mounted and should be provided with a housing for water and heat protection. They must also be provided with a circuit breaker between the PV modules and controller. Due to the high operating voltages proper earthing is essential, which must be done by a qualified electrician. As a rule all PV powered solar pumping systems should be provided with a solar module array with a nominal output about 30% greater than the motor size. The arrays should be wired in a combination of series and parallel connections to ensure that the correct voltage is available in to the inverter. It is important that the connection arrangement is approved by the pump supplier.

### OPERATING CONDITIONS

**Enclosure Class:** IP65

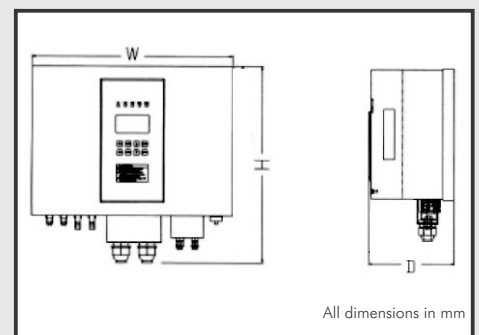
**Relative Humidity:** 0-95%

**Ambient Temperature:** -20°C to 60°C

**Frequency:** 0-60Hz

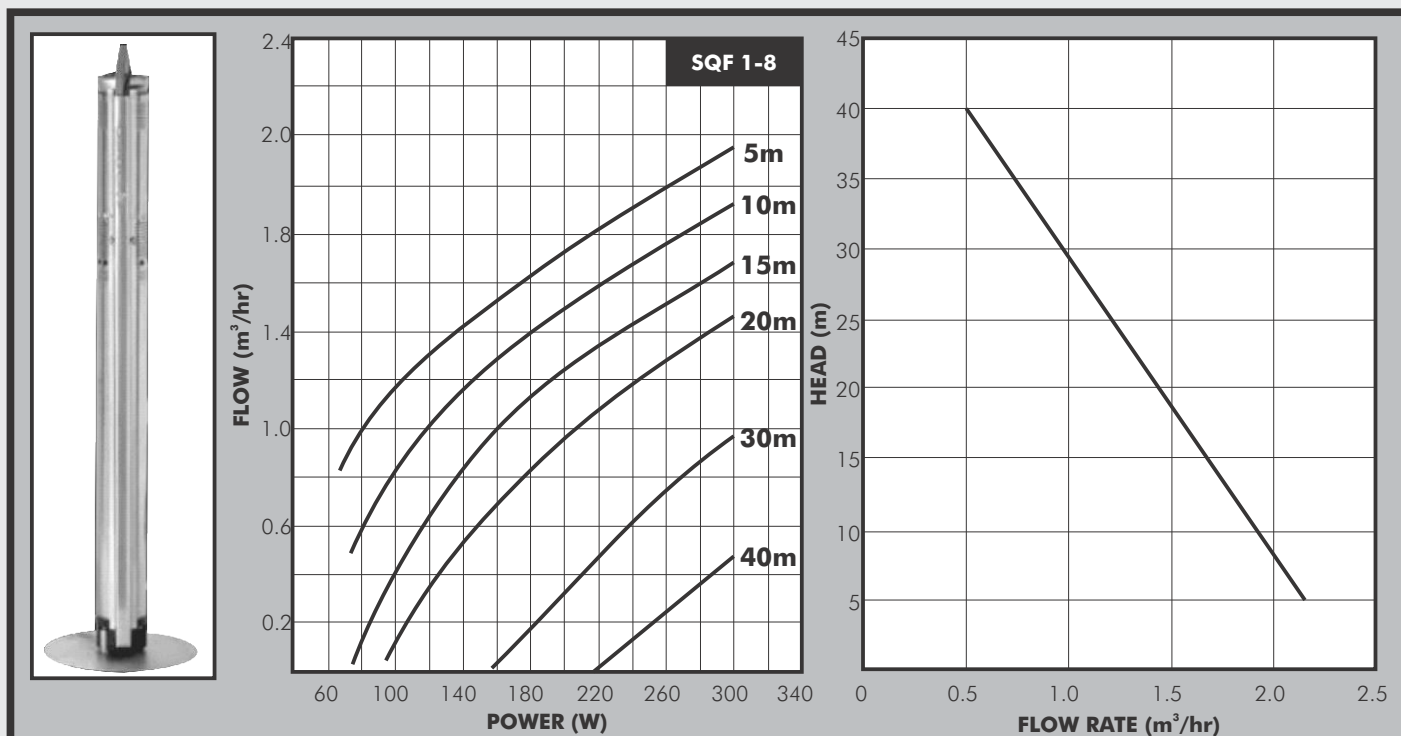
### CONTROLLER DATA

Model	Motor Rated Power (kW)	Rated Voltage	Max Solar Input Power (kWp)	Output Current (A)	Max DC Input Voltage VDC	MPP Voltage VDC	Dimensions (mm)			Weight (kg)
							H	W	D	
SV2/1.5M	1.1	1x240V	2.2	8.6	450	150-360	335		175	11
SV2/2.2M	1.5		3.3	11						11.5
SV2/3.7M	2.2		5.0	17		280-360				13
SV2/3.7T	3.7	3x415V	5.0	9	850	500-700	425	415	205	16.5
SV2/5.5T	5.5		8	13						17
SV2/7.5T	7.5		11	18						17
SV2/11T	11		16	24						17.5
SV2/15T	15		22	30						17.5
SV2/18T	18.5		28	39						17.5



All dimensions in mm





The SQF mini is a multistage submersible solar pump designed for water supply for boreholes and wells with low daily flow requirements. A particular feature is the hybrid capability with the option of solar, battery, mains and generator supply being available, the inbuilt controller automatically adapting to the input power. Pump construction is principally composite hydraulic components with stainless steel used for the pump casing and motor. Particular features include;

- Built in MPPT, maximum power point tracking, software and motor protection
- Wide voltage range and flexibility for AC/DC power sources
- Dry running protection
- Tank filling system through by use of CU200 control box
- Remote monitoring capability through GSM by use of CIU Flex

The SQF mini is particularly effective in replacement for wind and hand powered water supplies and flexibility produced together with great reliability and efficiency makes it the perfect solution for all small scale renewable energy and water supplies.

### MOTOR

The pump is coupled to a Grundfos MSF permanent magnet variable speed motor. It can be powered together by either AC or DC electrical supply. An integral central module uses MPPT technology that continuously optimizes output, efficiency and provides protection against over and under voltage, electrical overload and temperature.

**Enclosure Class:** IP68  
**Max Power:** 300W

**Speed Range:** 3000-10,700rpm  
**Max Current:** 8.4A

### OPERATING CONDITIONS

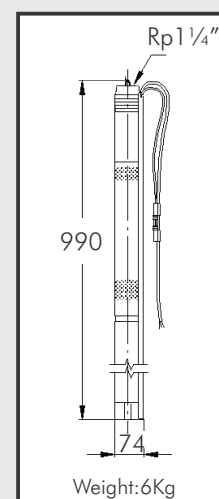
**Pump liquid:** Pumped Liquid: Thin, clean, non-aggressive liquids not containing fibres or particles with a sand content of upto 50g/m³

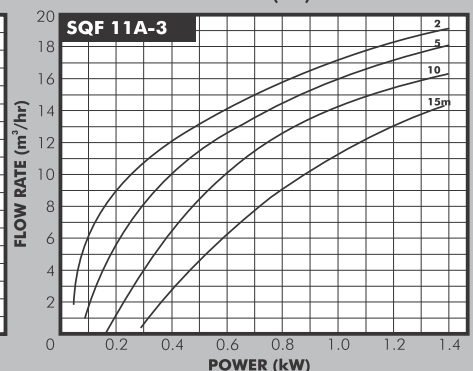
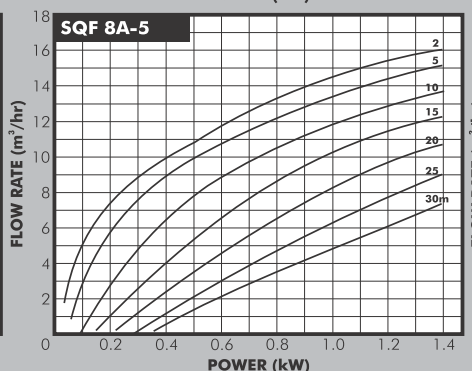
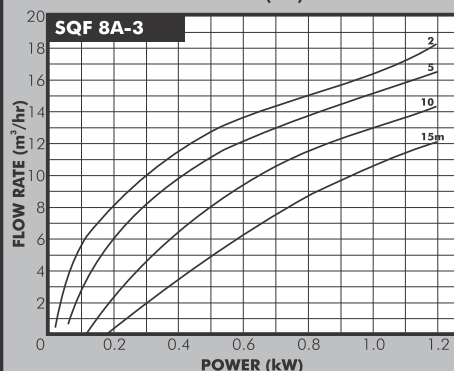
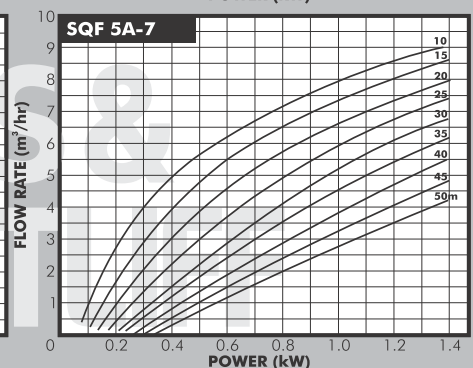
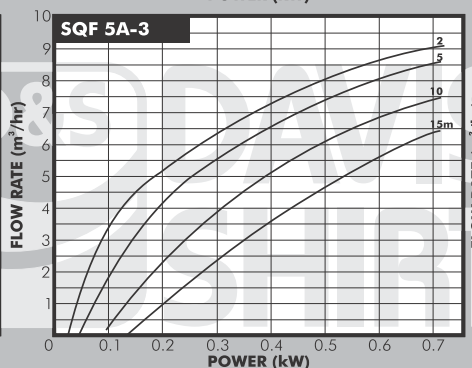
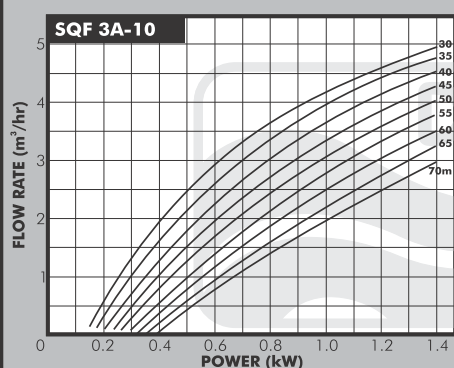
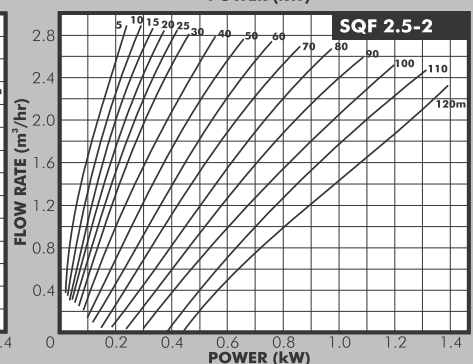
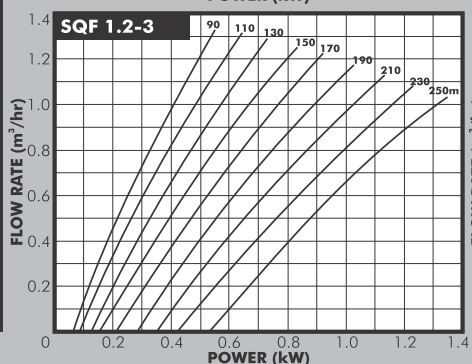
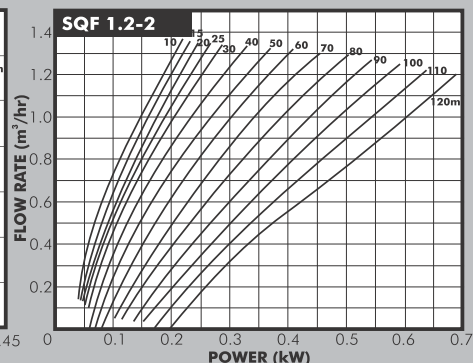
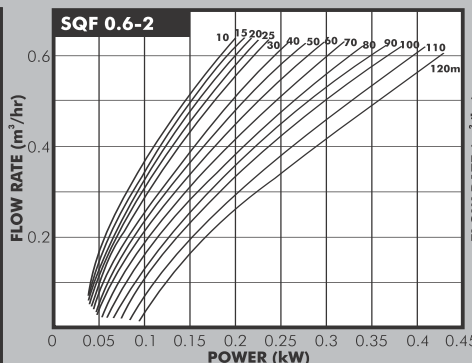
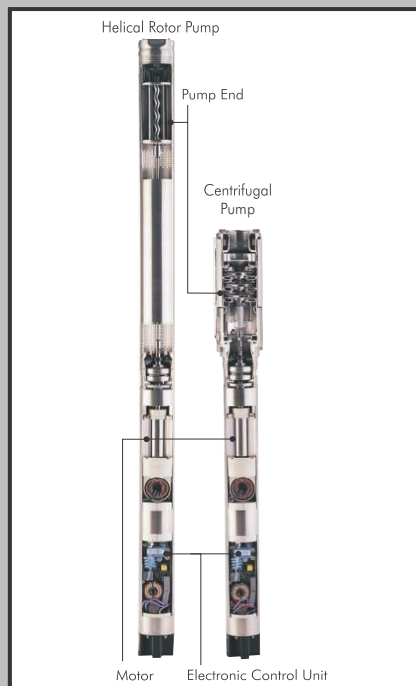
**Max. Liquid Temperature:** +40°C

**Pump Power Supply:** 30-300VDC, 1x90-240V, 50/60Hz AC

**Min Generator Size:** 1.55kVA

**Recommended PV Supply:** 2x200W, 24V panels, Series Connected giving 48V output





## PUMP OUTPUTS

Pump output curves are given at standard test conditions of 1000W/m<sup>2</sup> solar irradiance and 25°C.

Output will vary throughout the year depending upon prevailing irradiation levels. For estimated daily outputs at continuous pumping multiply by the daily irradiation given in Graph 1 (see drawing). For indicative purposes factors of 1.1 can be applied for hot arid areas and 0.9 for temperate high altitude areas in East Africa.

Output will vary through out the day as a proportion of the estimated hourly irradiation as shown in Graph 2.

**NOTE:** Output estimations are strictly indicative. More accurate projections are available using manufacturers data when the exact site location and installation arrangement is defined. This information will be provided with all offers.

## PUMP

A range of four models of helical rotor pumps for high heads and low flows (suitable for 3" boreholes) and six models of centrifugal pumps for low heads and high flows (suitable for 4" boreholes) are offered with stainless steel used extensively in construction for both pump designs. Pump model selection is determined by the duty requirement.

## MOTOR

One size of the unique 1400W Grundfos MSF 3 high efficiency permanent magnet motor is specified with all pump types. The motor can be powered by either DC or AC voltage within the range of 30-300V DC and 1X90-240V, 50/60Hz AC. An integral control module uses MPPT technology that continuously optimises output frequency to maximize system efficiency and protects against over and under voltage (except lightning), electrical overload and over temperature. Effective dry running protection is provided by a sensor in the motor cable. Maximum current is 8.4A and speed 3600rpm.

## CONTROL UNITS

A variety of switch boxes are available for the various installation options including IO50 for a manual solar system, IO101 for solar/generator systems and IO102 for a wind system. In addition a CU200 control unit is offered which provides for high-level switch control together with system monitoring and alarm indication.

## SOLAR MODULES

SQ Flex systems are recommended to be powered by crystalline photo voltaic modules connected in arrays to provide the power selected. Arrays should be connected to produce at least 40V input voltage with higher voltage of around 100V recommended for maximum efficiency operation.

## WIND GENERATOR

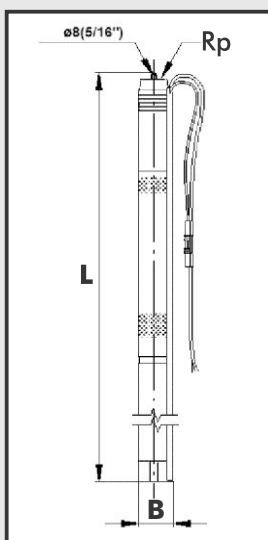
Permanent magnet 120V AC type alternator powered by an advanced 3.1m diameter rotor blade (8m<sup>2</sup> swept area) to provide greater output at lower wind speeds. The unit develops peak power of 1,000W at 11 m/sec (40km/hr) wind speed and will startup at 3m/sec (11 km/hr) wind speed, total generation power being 6.3kWhr per day.

## ACCESSORIES

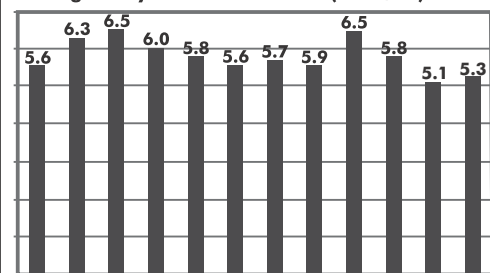
A complete range of accessories including connecting cabling and fittings, drop cable, module support structures and wind generator towers are available to provide all necessary components for a complete site installation.

## PUMP DATA

Model	Dimensions (mm)			Weight (kg)
	Rp (")	L	B	
SQF 0.6-2	1.25	1185	74	9
SQF 1.2-2	1.25	1225	74	10
SQF 1.2-3	1.25	1295	74	10
SQF 2.5-2	1.25	1247	74	10
SQF 3A-10	1.25	968	101	11
SQF 5A-3	1.5	815	101	10
SQF 5A-7	1.5	920	101	10
SQF 8A-3	2	920	101	11
SQF 8A-5	2	1011	101	12
SQF 11A-3	2	982	101	12

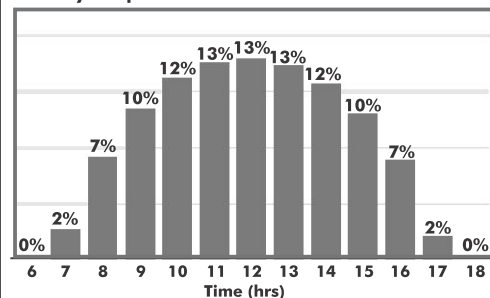


Average Daily Irradiation Values (Kwhr/m<sup>2</sup>)

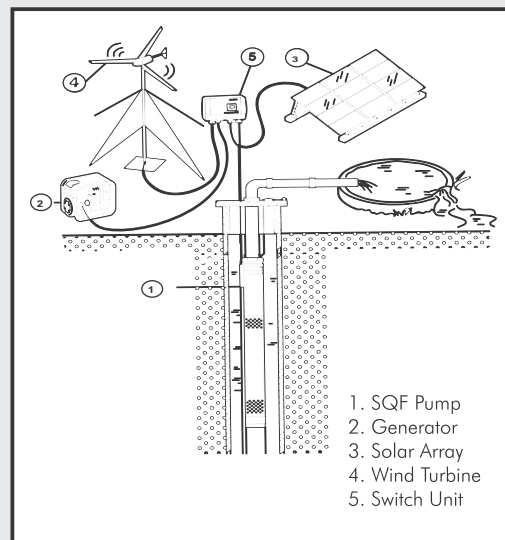


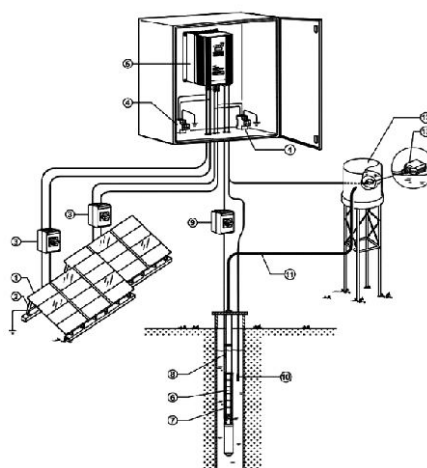
Graph 1

% Daily Output



Graph 2





1. Solar Panel
2. Mounting Structure
3. Circuit Breaker DC
4. Surge Protection DC\*
5. Renewable Solar Inverter
6. SP Pump
7. Cable
8. Submersible Drop Cable
9. Circuit Breaker AC
10. Dry running Switch
11. Pipe
12. Water Tower/Tank
13. Level Switch

## GRUNDFOS RSI SOLAR CONTROLLERS

Recent innovations in DC/AC inverter technology have led to the development of solar solutions for large system outputs, which use standard AC motors controlled by specially designed inverters. Grundfos RSI inverter systems have been re-engineered and improved and are especially compatible with a wide range of the world renowned Grundfos Submersible and surface pumps to create a modular system that can be customised to the requirements of each installation. Specific features include:-

- Suitable for all AC 3 phase motor sizes up to 37kW.
- Designed for all Grundfos SP pump models and can be retro fitted to existing installations.
- Advanced MPPT capability that optimises system performance by compensating for environmental condition improving water output by 30%.
- Set-up wizard that is pre-programmed with Grundfos motors making it easy to set up or pre-programme at the workshop before installation.
- Hybrid capability with option of switching between AC or DC power ensuring that the pump can be operated at any time of day . An external switch over box is required to connect the two power sources
- Adjustable operating parameters.
- Multiple sensor input.

Grundfos have been pioneers in solar pumping since the technology's beginnings and with their great experience, quality products and high system effectiveness offer the best solution for all solar pumping requirements.

## CONTROLLER FUNCTIONS

The controller offers the following control functions:-

- Detachable control interface
- Settable minimum and maximum frequency and open circuit voltage.
- Display of operating parameters including frequency, voltage, amperage, input power and pump speed.
- Display of historical data including energy generation, maximum power and operating times.
- Protection against over and under voltage, over current, system overload and module over temperature.
- Fault detection with error code display.

## INSTALLATION

As a rule all PV powered solar pumping systems should be provided with a solar module array with a nominal output about 30% greater than the motor size. The arrays should be wired in a combination of series and parallel connections to ensure that the correct voltage is available in to the inverter. It is important that the connection arrangement is approved by the pump supplier.

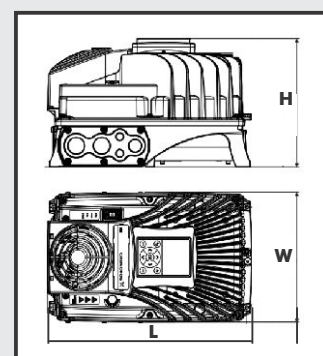
## CONTROLLER DATA

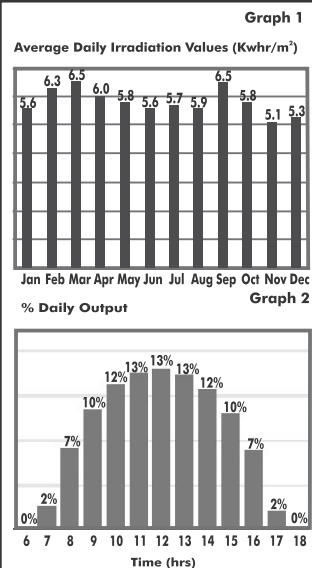
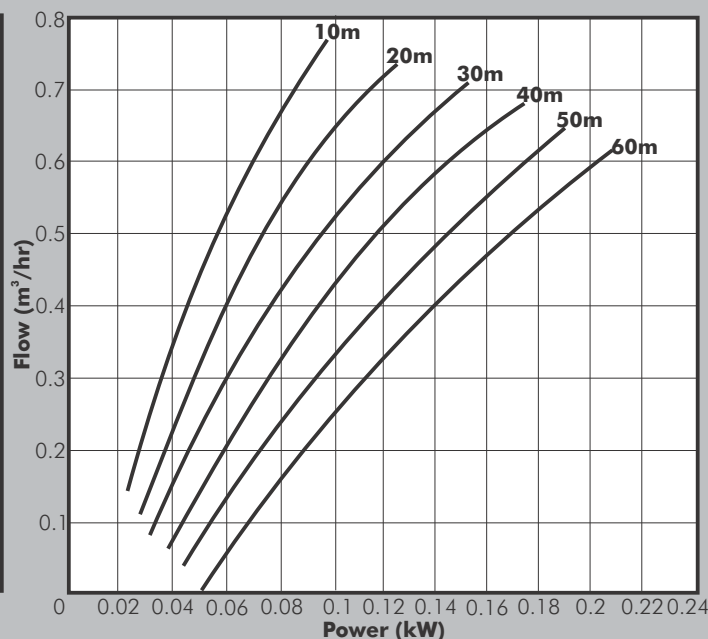
Model	Motor Power (kW)	Motor Voltage (VDC)	Solar Input Power (kW)	Max DC Input Voltage (VDC)	Min. MPP Voltage (VDC)	Output Current (A)	Frequency (Hz)	Dimensions(mm)			Weight (kg)
								L	W	H	
RSI003	3	3x380	3.9	800	400	8	5-60	315	191	214	9
RSI055	5.5		7.2			12		368	233	231	15
RSI075	7.5		9.8			14					
RSI110	11		14.5			16					
RSI150	15		19.5			31		500	322	254	32
RSI220	22		28.6			46					

Ambient Temperature: -10°+60°

Relative Humidity: 100%

Enclosure Class: IP66





#### PUMP

The Lorentz PS 150 HR-04S Solar Submersible Pump is a high specifications solar powered helical DC pump specifically designed for reliable small-scale water supply from boreholes and wells and is the ideal solution for remote pumping requirements in livestock watering, irrigation and general water supply applications. Pumps feature a remote surface mounted controller and are constructed principally from AISI 304/316 stainless steel and they are engineered to the highest standards to give easy serviceability, excellent efficiency, high reliability and long life.

#### MOTOR

Pumps are fitted to EC DRIVE 150-HR-S maintenance-free water-filled brushless DC motors without integrated electronics. They should be powered by solar arrays configured to provide the input voltage required and sized up to 200% of the rated motor power depending on local conditions.

**Speed:** 600-3300 rpm

**Insulation Class:** F

**Enclosure Class:** Ip65

#### CONTROLLER

The LORENTZ PS150 HR-04S Submersible Pump utilizes the PS 150 Controller. The controller is matched for monitoring, protecting and controlling pump operation that feature:-

- Sensor input for dry run protection and float switch.
- Integrated MPPT (Maximum Power Point Tracking) for maximum solar energy conversion efficiency.
- Protection against reverse polarity overload and over temperature.
- Low voltage disconnect for battery protection.

#### POWER INPUTS

Pump output curves are given at standard test conditions of 1000W/m² solar irradiance and 25°C cell temperature. Output will vary throughout the year depending upon prevailing irradiation levels. For estimated daily outputs at continuous pumping multiply the indicated output at the duty point by the daily irradiation given in Graph 1. For indicative purposes factors of 1.1 can be applied for hot arid areas and 0.9 for temperate high altitude areas in the Tropics. Output will vary throughout the day as a proportion of the estimated hourly irradiation as shown in Graph 2.

**NOTE:** Output estimations are strictly indicative. More accurate projections are available using COMPASS software when the exact site location and installation arrangement is defined. This information will be provided with all offers.

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids without solids and fibres.

**Maximum Liquid Temperature:** +50°C

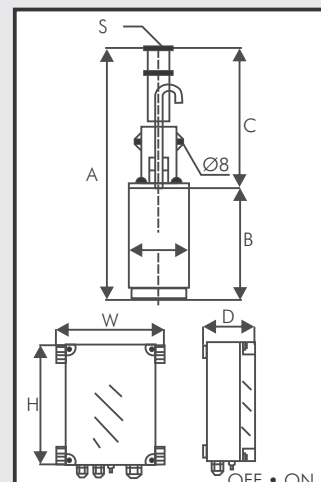
**Max Ambient Temperature:** +50°C

**Max Immersion Depth:** 250m

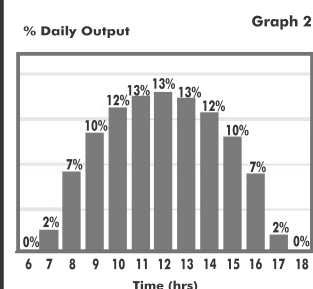
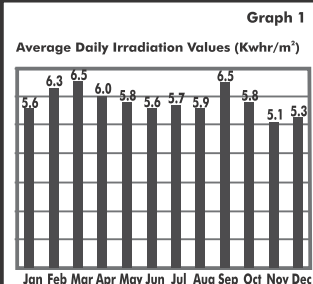
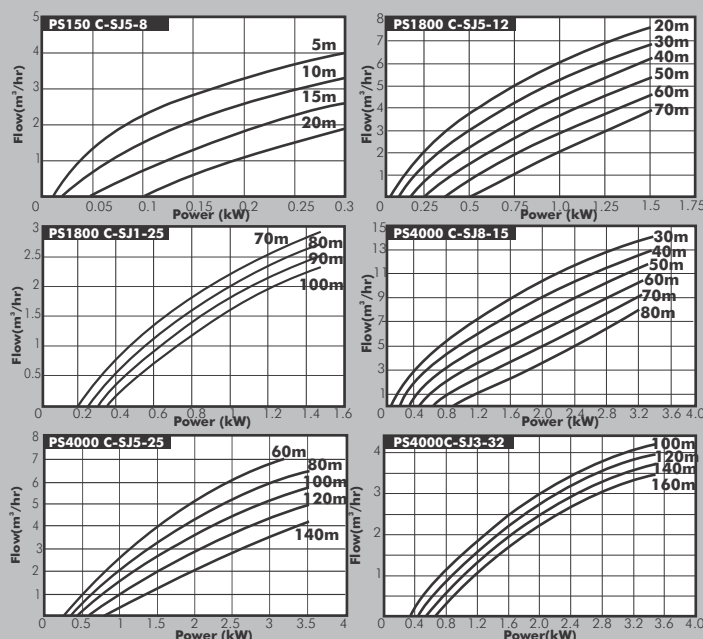
**Minimum Borehole Diameter:** 90mm (3.5")

#### PUMP DATA

Model	Power			Outlet (") S	Dimensions (mm)						Pumps Weight (kgs)
	kW	Current (A)	Voltage (V)		A	B	C	W	H	D	
PS150HR-04S	0.3	18	50	1.25	416	185	231	225	276	88	10







#### PUMP

The Lorentz PS2-C range are high specifications solar powered centrifugal DC pumps specifically designed for high flow borehole applications and feature a remote surface mounted controller. Pumps are constructed principally from AISI 304/316 stainless steel and are engineered to the highest standards to give easy serviceability, excellent efficiency, high reliability and long life.

#### MOTOR

The pumps are fitted to EC DRIVE C maintenance-free, water-filled brushless DC motors without integrated electronics. They should be powered by solar arrays configured to provide the input voltage required and sized upto 200% of the rated motor power depending on local conditions.

**Speed:** 900-3300 rpm

**Insulation Class:** F

**Enclosure Class:** Ip68

#### CONTROLLER

Pumps are provided with matched controllers for monitoring, protecting and controlling pump operation that feature:-

- Integrated data logging of all relevant technical parameters, flow and fuel cost savings easily accessible via pump scanner smart phone app.
- Advanced configuration options for daily flow rate, constant and min/max pressure, level and flow rate sensing.
- Sensor inputs for dry run protection, tank switch, water metering, pressure and level sensing.
- Switch output for external devices (e.g chlorine dosing units, irrigation valves etc).
- Integrated SunSensor for extended pump lifetime.
- Optional remote control functionality using the PS Communicator and pump Manager service.
- Integrated MPPT (Maximum Power Point Tracking) for maximum solar energy conversion efficiency.
- Protection against reverse polarity, overload and over temperature.
- Low voltage disconnect for battery protection.

#### PUMP OUTPUTS

Pump output curves are given at standard test conditions of 1000W/m² solar irradiance and 25°C cell temperature. Output will vary throughout the year depending upon prevailing irradiation levels. For estimated daily outputs at continuous pumping multiply the indicated output at the duty point by the daily irradiation given in Graph 1. For indicative purposes factors of 1.1 can be applied for hot arid areas and 0.9 for temperate high altitude areas in the Tropics. Output will vary throughout the day as a proportion of the estimated hourly irradiation as shown in Graph 2.

**NOTE:** Output estimations are strictly indicative. More accurate projections are available using COMPASS software when the exact site location and installation arrangement is defined. This information will be provided with all offers.

#### OPERATING CONDITIONS

**Pumped Liquid:** Thin, clean, chemically non-aggressive liquids without solids and fibres.

**Maximum Liquid Temperature:** +50°C

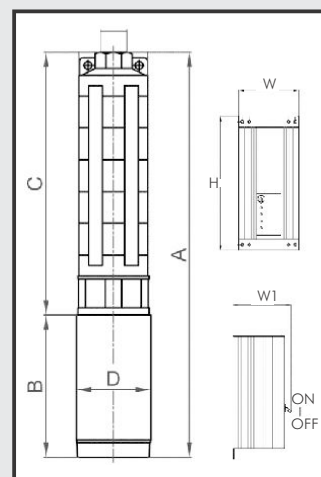
**Ambient Temperature:** -30°C - +50°C

**Max. depth of Immersion:** 250m

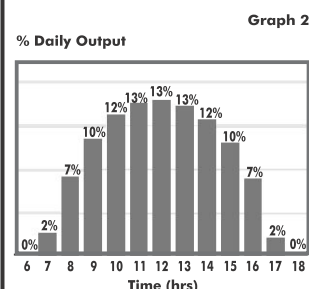
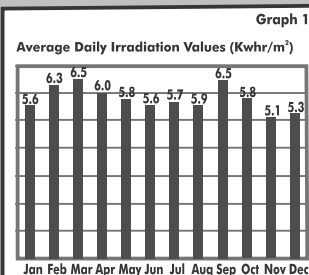
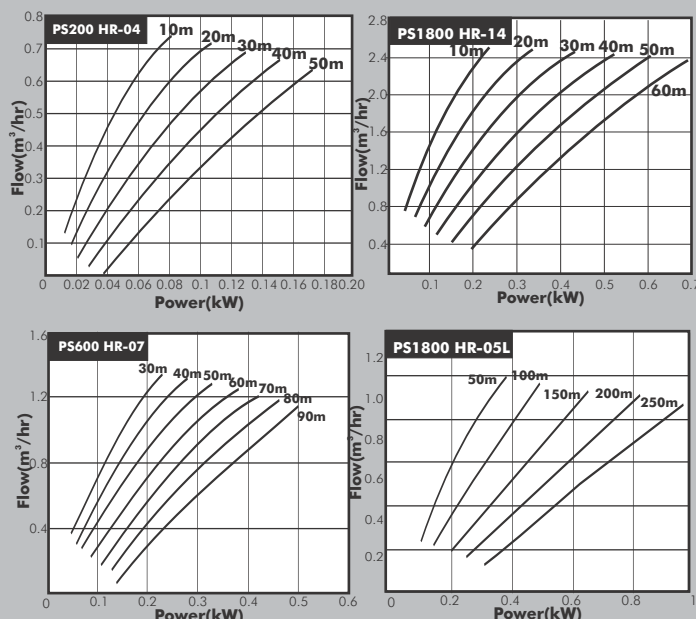
**Minimum Borehole Diameter:** 100mm (4")

#### PUMP DATA

Model	Power			Outlet (")	Dimensions (mm)								Weight (kg)
	kW	Max Current (A)	Max Input Voltage (V)		A	B	C	D	W1	H	W		
PS150 C-SJ5-8	0.3	18	50	1.5	524	185	339	96	108	276	225	12	
PS1800 C-SJ5-12	1.8	14	200	1.5	611	185	426	96	165	396	178	19	
PS1800 C-SJ1-25	1.8	14	200	1.25	881	185	696	96	165	396	178	21	
PS4000 C-SJ3-32	4	15	375	1.25	1088	245	843	96	165	595	178	29	
PS4000 C-SJ5-25	4	15	375	1.5	941	245	696	96	165	595	178	27	
PS4000 C-SJ8-15	4	15	375	2.0	1118	245	873	96	165	595	178	30	







#### PUMP

The Lorentz PS2-HR range are high specifications solar powered helical rotor pumps specifically designed for high head borehole applications and feature a remote surface mounted controller. Pumps are constructed principally from AISI 304/316 stainless steel and are engineered to the highest standards to give easy serviceability, excellent efficiency, high reliability and long life.

#### MOTOR

The pumps are fitted to EC DRIVE HR maintenance-free, water-filled brushless DC motors without integrated electronics. They should be powered by solar arrays configured to provide the input voltage required and sized upto 200% of the rated motor power depending on local conditions.

**Speed:** 900-3300 rpm

**Insulation Class:** F

**Enclosure Class:** Ip68

#### CONTROLLER

Pumps are provided with matched controllers for monitoring, protecting and controlling pump operation that feature:-

- Integrated data logging of all relevant technical parameters, flow and fuel cost savings easily accessible via pump scanner smart phone app.
- Advanced configuration options for daily flow rate, constant and min/max pressure, level and flow rate sensing.
- Sensor inputs for dry run protection, tank switch, water metering, pressure and level sensing.
- Switch output for external devices (e.g chlorine dosing units, irrigation valves etc).
- Integrated SunSensor for extended pump lifetime.
- Optional remote control functionality using the PS Communicator and pump Manager service.
- Integrated MPPT (Maximum Power Point Tracking) for maximum solar energy conversion efficiency.
- Protection against reverse polarity, overload and over temperature.
- Low voltage disconnect for battery protection.

#### PUMP OUTPUTS

Pump output curves are given at standard test conditions of 1000W/m² solar irradiance and 25°C cell temperature. Output will vary throughout the year depending upon prevailing irradiation levels. For estimated daily outputs at continuous pumping multiply the indicated output at the duty point by the daily irradiation given in Graph 1. For indicative purposes factors of 1.1 can be applied for hot arid areas and 0.9 for temperate high altitude areas in the Tropics. Output will vary throughout the day as a proportion of the estimated hourly irradiation as shown in Graph 2.

**NOTE:** Output estimations are strictly indicative. More accurate projections are available using COMPASS software when the exact site location and installation arrangement is defined. This information will be provided with all offers.

#### OPERATING CONDITIONS

**Pumped liquid:** Thin, clean, chemically non-aggressive liquids without solids and fibres.

**Maximum liquid temperature:** 50°C

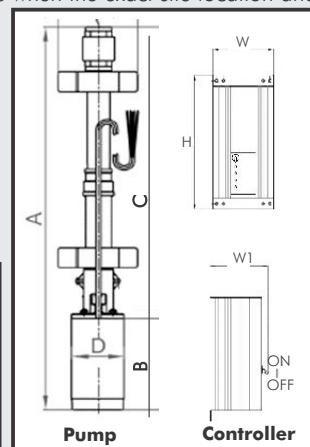
**Ambient Temperature:** -30°C - +50°C

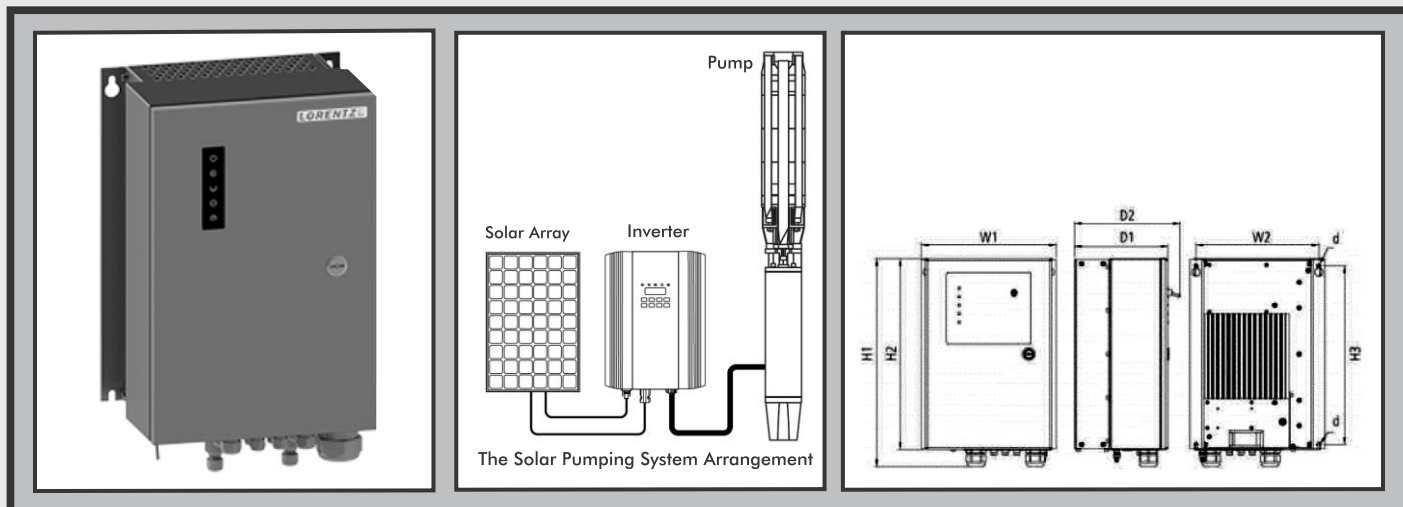
**Max. depth of immersion:** 250m

**Minimum borehole diameter:** 100mm (4")

#### PUMP DATA

Model	Power			Outlet (")	Dimensions (mm)							Weight (kg)
	kW	Max Current (A)	Max Input Voltage (V)		A	B	C	D	W1	H	W	
PS200 HR-04	0.3	11	100	1.25	780	185	595	96	108	276	225	12
PS600 HR-07	0.7	13	150	1.25	771	185	586	96	165	396	178	17
PS1200 HR-14	1.8	14	200	1.25	771	185	586	96	165	396	178	17
PS1800 HR-05HL	1.8	14	200	1.25	879	185	694	96	165	396	178	18





### LORENTZ SOLAR CONTROLLERS

The heart of all AC solar pumping systems is the controller and Lorentz Psk2 controllers combine high levels of functionality with high efficiency and reliability for a wide range of borehole and surface pumps. The controller inverts DC input to AC output and adjusts the output frequency in real time according to the prevailing irradiation levels. A particular feature of the design is true hybrid capabilities which automatically blends grid and generator power with the core solar power supply to provide consistent 24 hour pumping when required, thus maximising the use of installed solar capacity. Particular features include:-

- Integrated data logging of all relevant technical parameters, flow and fuel cost savings easily accessible via pump Scanner smartphone App.
- Advanced configuration options for daily flow rate, constant and min/max pressure, level and flow rate sensing
- Sensor inputs for dry run protection, tank switch, water metering, pressure and level sensing
- Active temperature management for full power up to 50°C ambient temperature and power derating from 50 to about 60°C ambient temperature.
- Integrated SunSensor for extended pump lifetime.
- Optional remote control functionality using the PS Communicator and pump Manager service
- Optional SmartPSUk2 features fully automated and manual hybrid operation for blending solar and grid/ diesel power for 24/7 water supply while minimizing operational costs.
- Optional SmartStart to switch/ on off diesel generator and additional switch output for external devices (e.g. chlorine dosing units, irrigation valves etc.)
- Integrated MPPT (Maximum Power Point Tracking) for maximum solar energy conversion efficiency
- Protection against reverse polarity, overload and over temperature.

### INSTALLATION

LORENTZ Psk2 controllers are surface mounted, rain and dust-proof. They must also be provided with a DC disconnect switch between the PV modules and controller. Due to the high operating voltages proper earthing is essential, which must be done by a qualified electrician. As a rule all PV powered solar pumping systems should be provided with a solar module array with upto 200% of the rated motor power depending on local conditions. The arrays should be wired in a combination of series and parallel connections to ensure that the correct voltage is available in to the inverter. More accurate projections are available using COMPASS software when the exact site location and installation arrangement is defined. This information will be provided with all offers.

### OPERATING CONDITIONS

**Enclosure Class:** IP54 **Ambient Temperature:** -30° + 50°C

**Max. Efficiency:** 98%

**Speed Range:** 1400-3135rpm for submersible pumps, 700-2905rpm for surface pumps

**Input Voltage:** Max 850V, Operating Vmp ->575V

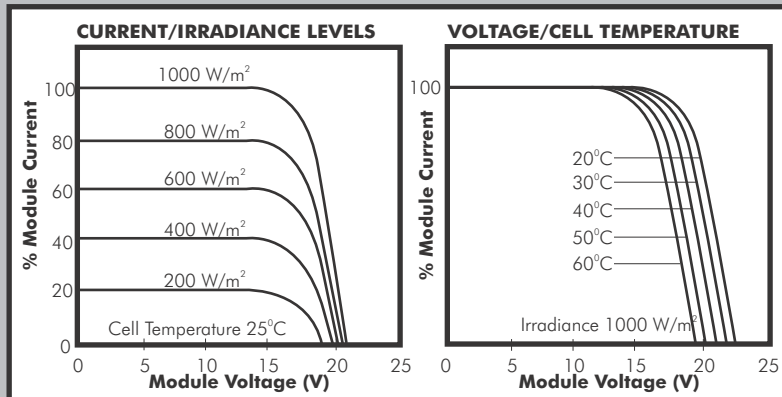
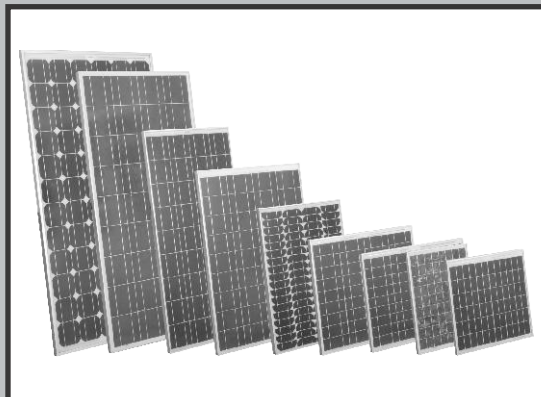
### CONTROLLER DATA

Model	Pump Motor Power (kW)	Pump Motor Voltage (VDC)	Max. Solar Input Power (kWp)	Max DC Input Voltage (VDC)	MPP Voltage (VDC)	Output Current (A)	Frequency (Hz)	Dimensions (mm)							Weight (kg)
								W1	H1	D2	W2	H2	D1	d	
PSk2-7	5.5	380-440	8	850	500-600	14	0-60	320	450	250	290	405	220	9	17
PSk2-9	7.5		10			20									
PSk2-15	11		15			27									
PSk2-21	15		21			39									
PSk2-25	18.5		25			48									
PSk2-40	30		37			70									



# Photo Voltaic Solar Modules

## TYPICAL PERFORMANCE CHARACTERISTICS (Nominal 12V Cells)



The heart of all effective photovoltaic systems is an efficient and reliable solar module and there are none better than Dayliff PV Modules. All are sourced from global PV module leaders who comply with the highest standards of quality and durability and offer the following features:-

- High efficiency multi crystalline solar cells with minimum 15% energy conversion rates to provide maximum power even under weak light.
- High transmission rate tempered glass with an anti-reflection coating to increase the power output and provide mechanical strength.
- Multi function water proof junction box for easy connection.
- 25 year power output warranty.
- Global Certification.

Modules are sourced from three of the world leading PV module manufacturers:-

### Solar World

SolarWorld is Europe's largest manufacturer of PV modules with over 30 years experience in the industry and a reputation for quality and innovation. Modules are manufactured in Germany in fully automated ISO certified factories and independent tests have rated all sizes at the highest 'excellent' quality level. All Solarworld modules are also fully internationally certified as follows:-



### Yingli and Topray

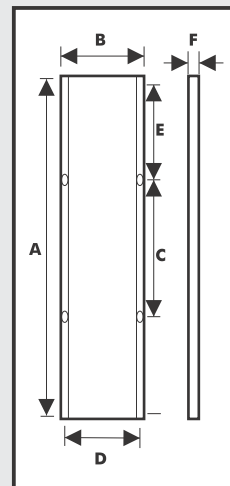
Yingli Solar and Topray PV module manufacturers are both large scale vertically integrated manufacturers that process from polysilicon production to module assembly to ensure consistently high quality levels. Both module types are recognised as quality products and are internationally certified by TUV Rheinland to ISO, CE and IEC standards as follows.

All Dayliff modules are manufactured to the highest standards and are guaranteed to provide reliable performance over long life spans. They are quality products in terms of both technology and performance and are ideal power sources for all types of solar applications.



## PV MODULE DATA

Model	Rated Power (W)	Nominal Voltage (V)	Peak Voltage (V)	Open Circuit Voltage (V)	Short Circuit Current (A)	Number of Cells	Dimensions (mm)						Weight (kg)
							A	B	C	D	E	F	
SL20	20	12	18	21.6	1.2	36	496	495	296	350	100	23	1.98
SL40	40	12	18	21.6	2.5	36	665	665	316	516	100	25	3.7
SL50	50	12	18	21.6	2.9	36	667	665	467	588	100	25	4.25
SL60	60	12	18	21.6	3.7	36	689	665	467	667	100	25	5.35
TPS85	85	12	17.6	21.6	4.9	36	759	637	599	664	80	25	6
TPS100	100	12	17.8	21.2	6	72	1006	626	646	664	180	35	7.3
TPS125	125	12	17.5	21.5	7.4	36	1179	626.4	899	664	140	35	9
TPS150	150	24	36	43.2	4.45	72	1486	626.4	1206	664	140	35	11.5
TPS195/200	195/200	24	36	43.2/44.5	5.79/5.7	72	1316	954.4	1036	992	140	35	13.7
YL195	195	24	36.7	45.4	5.65	72	1335	946	770	990	282.5	40	15.2
YL265/270	265/270	24	30.5/30.8	37.8/37.7	9.18/9.28	60	1650	948	990	992	330	35	18.5
SW265	265	24	30.8	39	9.31	60	1675	951	1099	1001	228	31	21.2
YL315/320	315/320	24	36.8/37	45.7/46	9.12/9.18	72	1960	948	1300	992	330	40	22



Data is given at Standard Test Conditions: Irradiance 1000W/m<sup>2</sup>, spectrum AM 1.5 and 25°C cell temperature

\* Polycrystalline else Multicrystalline



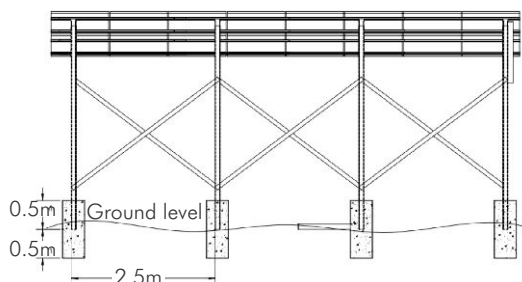
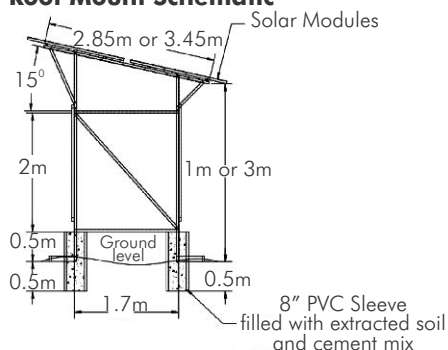
A well designed solar PV support structure is of paramount importance to the long term durability of any solar installation. Structures should be strong and secure and for both ground and roof mount systems be able to endure the substantial forces of the panel weights and high wind speeds.

DAYLIFF solar structures are the ideal solution being strong and light weight as well as very affordable, easy to transport, long lasting and require minimal maintenance. The structures are modular in design using only two light gauge steel profiles and provide a very efficient support structure including the PV module support platform, legs and bracing all simply secured with self tapping screws. They are designed to be mounted in 8" light cement filled pipe sleeves and so are very easy to erect. The system is adaptable to suit arrays of any size and is suitable for all roof and ground mount applications. Several standard designs are available for the majority of systems though individual designs are available for special applications. Particular features include:-

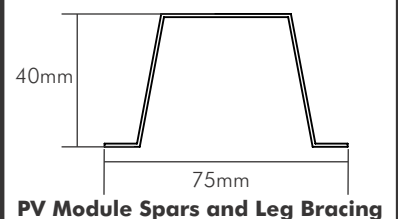
- Fabricated using two high tensile grade G550 galvanised steel profiles with silver matte finish that requires no painting. They are corrosion proof, of exceptionally high bending strength and very light.
- Simple and quick installation using easy fixing self drilling, self tapping screws that is especially beneficial in remote sites.
- Supplied in modular pre-assembled sections for ease of transport and installation.
- Ground mount systems are suitable for installation heights up to 3m and can be secured in concrete filled sleeves or foot mounted on flat concrete surfaces.

## Technical Specifications

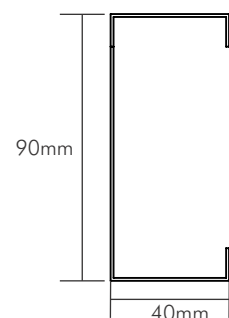
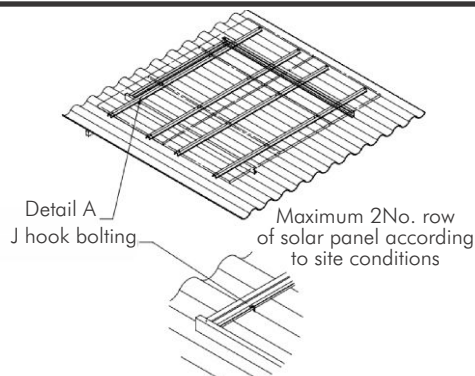
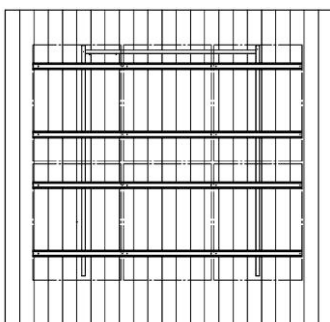
### Roof Mount Schematic



### Steel Section Detail

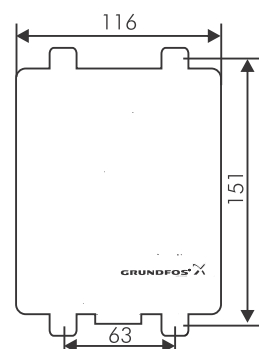
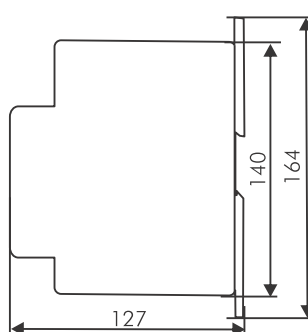


### Ground Mount Support Schematic



Legs and Main Supports





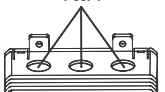
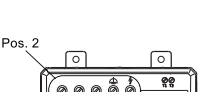
The Grundfos MP204 is a state of art electronic motor protector for asynchronous motors and can be used with both single and three phase motors. The unit consists of an enclosure incorporating instrument transformers and electronics and a control panel with operating buttons and display for reading data. It offers motor protection against current and voltage irregularities, dry running, earth leakage, high internal motor temperature and power factor. It also monitors harmonic distortion, starting and running capacitances if used with a single phase motor and can be connected to an external PTC thermal cutout switch.

Particular features include:

- Tripping if a condition of overload, underload (dry run), high temperature, missing phase, wrong phase sequence, overvoltage, undervoltage, low power factor or current unbalance is detected.
- Warning against overload, underload, high temperature, overvoltage, undervoltage, low power factor, low capacitance (single phase), and harmonic distortion.
- A learning function that enables the unit to measure and store the phase sequence for three phase motors and the capacity of the start and running capacitors for single phase motors.
- Accurate measurement of current and voltage by true RMS measurement sampling each cycle 256 times.
- Use of R100 remote control which allows adjustment of various factory settings, carry out service and trouble shooting and read out data stored in the unit.

The Grundfos MP204 is a high specification unit that provides comprehensive protection and allows monitoring and user interaction. It is easy to install and set up and mounting is done by means of four screws or by sliding the unit onto a DIN mounting rail. It handles currents up to 1000A, though at currents above 120A, current transformers must be used.

### CONNECTION

	Pos. 1	Pos	Designation	Three Phase Connection	Single Phase Connection	Cable	
		1	L1	Entry for phase L1 to motor	Entry for neutral	Max. Ø 16mm	
	Pos. 2		L2	Entry for phase L2 to motor	Entry for phase		
			L3	Entry for phase L3 to motor	Entry for auxiliary winding		
		2	L1/N	Supply: L1	Supply: Neutral	Max. 6mm <sup>2</sup> though 10mm <sup>2</sup> with cable terminal	
			L2/N	Supply: L2	Supply: Phase		
			L3/A	Supply: L3	Auxiliary winding		
	FE	Functional earth					
	5	Insulation measurement					

### TECHNICAL DATA

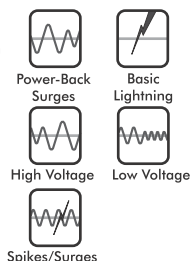
Ambient Temperature	During Operation: -20°C to + 60°C (must not be exposed to direct sunlight)
	In stock: -25°C to + 85°C
	During Transportation: -25°C to + 85°C
Relative Humidity	From 5% to 95%
Materials	Enclosure Class: IP20
	Plastic type: Black PC/ABS
Supply Voltage	100-480 VAC, 50/60Hz
Current Consumption	Max 5W
Short-circuit rating	Suitable for use in a circuit capable of delivering not more than 15000RMS symmetrical amperes, 480V maximum



# Power Protection Controllers

Dayliff power controllers are quality products used in various applications. This includes monitoring the incoming power supply and when outside pre-set limits disconnect the equipment, reconnecting on return of normal power after a start-up delay to protect against damaging power-back surges. The controllers are fitted with LED lights indicating the power status and installation couldn't be simpler. All controllers offer complete and reliable protection against the damage caused by fluctuating power and are essential accessories for all environments where there is a risk of inconsistent power supply.

## AUTOMATIC VOLTAGE SWITCHER (AVS 13&15)



**Max Load:** 13A/15A Single Phase

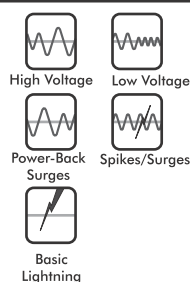
**Reconnection Time:** User adjustable up to 3mins

**Protection:** High Voltage, Low Voltage, Power Back Surges, Spikes/Surges, Lightning

**Applications:** All electrical and electronic appliances, 15A particularly suitable for AC's.

**Physical Data:** Wt 500gms, Dimensions 230x134x54mm

## AUTOMATIC VOLTAGE SWITCHER (AVS 30)



**Max Load:** 30A, Single Phase

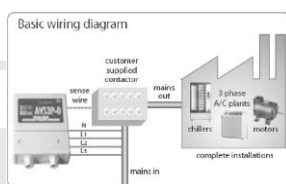
**Reconnection Time:** User adjustable up to 10mins

**Protection:** High Voltage, Low Voltage, Power Back Surges, Spikes/Surges, Lightning

**Applications:** All electrical and electronic equipment, complete office and home circuits. direct wire connected.

**Physical Data:** Wt 600gms, Dimensions 230x134x54mm

## AUTOMATIC VOLTAGE SWITCHER (AVS 3P)



**Max Load:** 9A 3 Phase direct load. Can be wired through control circuits for higher load capacity.

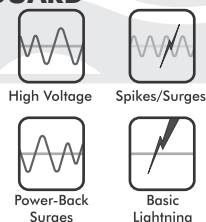
**Reconnection Time:** User adjustable up to 10mins

**Protection:** High Voltage (user adjustable), Low Voltage (user adjustable), Power Back Surges, Spikes/Surges, Lightning, Single Phasing.

**Applications:** All electrical devices.

**Physical Data:** Wt 600gms, Dimensions 205x135x54mm

## SOLLATEK HI VOLT GUARD



**Max Load:** 5 Amps, Single Phase

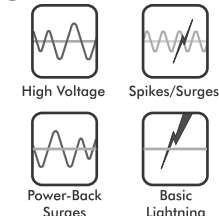
**Reconnection Time:** 30secs

**Protection:** Overvoltage, Spikes/Surges, Power Back Surges, Lightning

**Applications:** TV, Hi-fi, Video, PABX, Computers

**Physical Data:** Wt 250gms, Dimensions 250x130x95mm

## SOLLATEK FRIDGE GUARD



**Max Load:** 5A, Single Phase

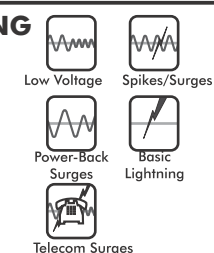
**Reconnection Time:** 90secs

**Protection:** Under voltage, Spikes/Surges, Power Back Surges, Lightning

**Applications:** Fridges, Freezers and Compressors

**Physical Data:** Wt 250gms, Dimensions 250x150x95mm

## SOLLATEK LIGHTNING GUARD



**Max Load:** 5A Single Phase

**Reconnection Time:** 30secs

**Protection:** High Voltage, Spikes/Surges, Power Back Surges, Lightning, Telecom Surges. Prevents Lightning, Mains Surges and Spikes entering the telephone circuits.

**Applications:** Modem, Fax, Telephone. An RJ11 phone socket is provided.

**Physical Data:** Wt 300gms, Dimensions 180x90x95mm





The DAYLIFF range of pump control panels have been specially designed to provide effective protection and reliable control of all electric pumps. Standard panels are available for one and two pump installation in all sizes up to 90kW for both manual and automatic installations operation. In addition various optional accessories are offered so panels can be customised to suit site requirements. Panels for multi pump, large motors and specialised control applications can also be supplied, these being individually designed to suit the particular installation.

All panels utilise quality components and are supplied completely pre-wired with terminals for control accessories (where applicable) as well as incoming and outgoing power connections. Comprehensive wiring diagrams are provided with all panels.

Enclosures are manufactured of mild steel and finished with a hard baked non-chip dry powder epoxy finish. The degree of ingress protection is IP54 or higher. As a standard, the enclosures are wall mounted type with hinged lockable door fronts. Free standing enclosures can be provided on order.

All panels are manufactured to exacting standards and are quality products which complement the wide range of pumps available from DAVIS & SHIRTLIFF to provide cost effective, reliable and efficient water installations.

## STANDARD PANELS

Standard panels are categorized based on the Starting Methods of the motor. Motor Manufacturers usually specify the starting methods and voltage on the motor name plates.

All panels are available in two quality specifications;

- Standard, which includes quality components with essential functionalities.
- Premium, which includes internationally branded quality components from Schneider, Lovato, Siemens, ABB, Danfoss (VFD) according to availability.

### Type 1PM (one pump) and 2PM (two pumps):

Manual panel for small single-phase pumps. Specification includes Incoming isolator, MCB, 'ON' indicator and (motor sizes > 1.1kW), Relay and Auto/Hand selector switch. Two pump panels have paired component sets with a 102 Changeover switch. These are suitable for use with single phase borehole motors where control box is provided complete with capacitors.

### Type 1PD (one pump) and 2PD (two pumps):

Standard panels for Direct-On-Line (DOL) start. Specification includes Incoming Isolator, individual pump MCB's, DOL Starter (Contactor & Overload relay), 'On' and 'Trip' indicators and Auto-Off-Hand Selector Switch. Two pump panels have paired component sets and a 102 Changeover when CCA (Auto Cycle & Auto Trip Changeover) is specified and individual Auto-Off-Hand Selector Switches when independent pump operation is specified.

### Type 1PY (one pump) and 2PY (two pumps):

Standard panels for Star-Delta start. Specification is as for type 1&2PD with the alternative fitting of a Star-Delta Starter(s) with three Contactors, Overload Relay and Timer.

### Type 1PS (one pump) and 2PS (two pumps):

Standard panels for Soft starters. Specification includes Incoming Isolator, individual pump MCB's, SOFT-STARTER, Line and Bypass Contactors, 'On' and 'Trip' indicators, Start-Stop push button, Reset push button and Auto-Off-Hand Selector Switch. The advantage of these panels is that they reduce mechanical stress on the motor and shafts for extended motor life. They also lower starting current and system electrical load reduce water hammer effect and check valve slamming.

**Type 1PV (one pump) and 2PV (two pumps):**

Standard panels for Variable Frequency Drive (VFD) starters. Specification includes Incoming Isolator, individual pump Fuses, VFD Starter, Thermal Management fans and thermostat, 'On' and 'Trip' indicators, Start-Stop push button, Emergency push button and Auto-Off-Hand Selector Switch. Main advantages is that they modulate actual motor speed provides energy cost savings particularly in applications with less than 50% static head, reduce mechanical stress on the motor and shaft, lower starting (inrush) current, reduce water hammer effect and check valve slamming.

**PANEL SIZES**

	TYPE	PREFIX	RATING	MOTOR
SINGLE PHASE	M	1	1	0.37 - 0.75kW
	M or D	1	2	1.1 - 1.5kW
	D	1	3	2.2kW
THREE PHASE	D Y S V	3	4	1.1 - 4kW
		3	6	5.5kW
		3	8	7.5kW
		3	11	9.2 - 11kW
		3	15	13 - 15kW
		3	18	18.5kW
		3	22	22kW
		3	30	26 - 30kW
		3	45	37 - 45kW
		3	55	55kW
		3	75	75kW

**STANDARD OPTIONS**

**Analog Ammeter (MA):** Indication of current on one phase. As an option, a phase selection switch can be provided for three phase control panels.

**Analog Voltmeter (PV):** Indication of voltage on one phase and all phases for single-phase and three-phase respectively. A phase selection switch is included for three phase control panels.

**Voltage Relay (PP):** Protects against over/under voltage, phase sequence, phase asymmetry and phase failure.

**Surge Protection Device (SPD):** Protects equipment against indirect power surges.

**Lightning & Surge Protection Device (LSPD):** Protects equipment against high current surges arising from lightning strikes in addition to indirect power surges. Required for protection of equipment in buildings with Lightning Protection System.

**Liquid Level Control (CL):** For control of low water levels using electrodes.

**Analog Frequency Meter (FF):** Indication of power frequency.

**Analog Hour meter (MH):** Indication of running hours.

**Digital Multi-Function Monitor (MD):** Includes selectable amps, volts, cos  $\phi$

**Timer (CT):** Delay timer for automatic control, especially when using pressure switches.

**Timer Switch (CS):** 24hrs time switch to set the desired time for pump operation.

**Level Alarm (CA):** Activates an alarm to indicate high or low water levels. The alarm can be Audio (Siren) or Visual (Flasher) which should be specified during order placement.

**Grundfos MP204 Controller (MP204):** Includes the Grundfos MP204 integral pump controller unit and necessary fuse protection. The MP204 controller digitally monitors current consumption and asymmetry, supply voltage, phase sequence, motor temperature and insulating resistance and protects installation against dry running, mechanical motor defects and high temperature.

**Note:** Temperature monitoring and protection is only available for Grundfos motors with tempcon.

**Auto Cycle & Auto Trip Changeover (CCA):** For two pump Duty Standby operation only. Balances operating time through alternating the duty pump at each call of pressure switch/floatswitch.

Duty-Standby-Assist configuration is also available and should be specified during order placement.

**Power Factor Correction Capacitors (PFC):** For Reactive Energy Management, capacitors are used to improve the power factor (PF) hence power quality. Size (kvar) depends on motor load (kW), existing PF and desired PF.

**Note:** SPD, LSPD and PFC options are provided in separate enclosures. The can also be fitted in the pump control panel. This should be specified during order placement.

**NOMENCLATURE**

Panels are referenced as follows:

**1 or 2:** No of pumps

**P:** Pump Control Panel

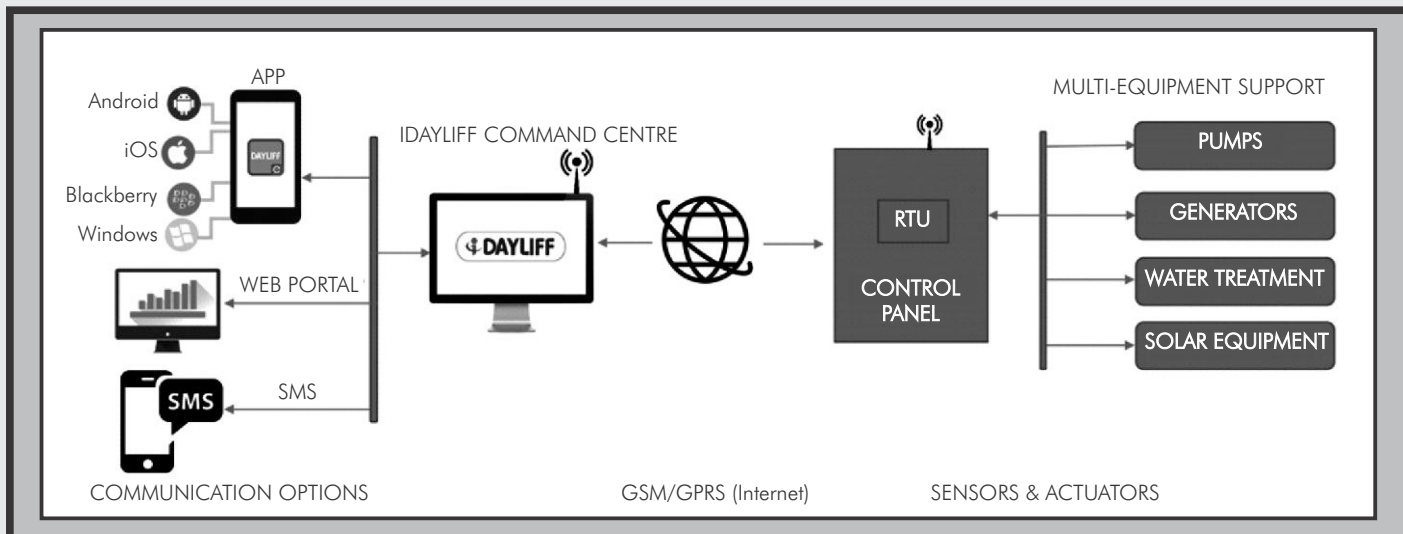
**M, D, Y, S, V:** Starting specification

**S,P:** Standard or Premium Quality

**1xx, 3xx :** Rating

**Example:** 1PDS304 – One pump, DOL start Standard panel, three phase 4kW

2PYP345 – Two pump, YD start, Premium panel, three phase 45kW



iDAYLIFF is a high specification internet-based system for remote monitoring and control of equipment. It is available as an option with any DAYLIFF pump, generator, solar and water treatment installation and provides users with specific information regarding the operation of their equipment. The iDAYLIFF system is built on modern infrastructure to ensure reliability, speed and accuracy of information.

### RTU (REMOTE TERMINAL UNIT)

The heart of the system is the RTU controller that monitors various selected conditioned signals and relays the data to the iDAYLIFF Command Center from where such information is disseminated to respective mobile phones and internet applications. The RTU is fitted with a SIM card and so the installation must have a mobile GSM network signal available to operate. It then transmits the data received in selectable communication channels depending on availability.

### iDAYLIFF COMMAND CENTER

This forms the data terminal for the entire system. Data sent from the various RTUs are received, interpreted, stored and dispatched to various channels. It also issues user generated commands to the RTUs to action on the monitored equipment.

Depending on system specification and fitted sensors, the iDAYLIFF user is able to see real time equipment operation status, alarms and parameter readings such as:

- Start and Stop.
- Trip due to overload.
- Current and Voltage
- Power supply failure.
- Water flow rate and system pressures (special sensors required)
- Energy consumption (special sensor required)

The user is also able to perform the following:

- Start and stop equipment.
- Schedule equipment operations.
- Report emergency conditions to the iDAYLIFF Field Service team.

### MULTI-PLATFORM MOBILE APPLICATION

An iDAYLIFF App is available for all popular mobile and computer platforms – Android, iOS, Microsoft (Windows Phone & Windows 10) and Blackberry. The app receives information through automated Push Notifications to the user in real time.

### iDAYLIFF WEB PORTAL

Features a web version of iDAYLIFF that can be accessed via the internet and provides a dashboard showing graphical data of equipment status and history. The web portal includes a choice to receive notifications via e-mail regarding the status of the equipment.

### SMS NOTIFICATION

Alerts are delivered on an event based frequency via SMS texts to the selected users. SMS is specifically meant for areas with low GPRS coverage.

iDAYLIFF enables equipment operators to improve operating efficiency and monitor system non-conformities that will greatly improve the reliability of water and energy supply, the only running cost being SMS and data bundle charges. The technology is well-proven and reliable and iDAYLIFF is an invaluable tool that reduces overall system operating costs.



# DRYTEK

## Electronic Pump Controller



### PUMP

The Dayliff Drytek Electronic Pump Controller is a solid state integrated control unit for all types of pumps with a particular application to borehole installations. Panels are fitted with a digital display of both operating and fault parameters and settings are simply made using fascia mounted push buttons. A range of sizes are available for single and three phase motors, settings for particular motor sizes being effected by simple adjustment of the running current. Panels also offer the following features:-

- Incoming mains isolator switch with fuse protection and door interlock.
- Digital display of motor operating status including voltage, amps, cos  $\phi$  and fault messages.
- Protection against over/under voltage, motor overload and phase sequence/loss.
- Electronic dry run protection using cos  $\phi$  sensitivity adjustment dispensing with the need for low level electrodes and cables.
- Selectable auto/manual operation with an extra terminal set for an additional external control function, e.g float switch or pressure switch.
- Auto restart for fault signals with 4 separate adjustable times from 0-250 mins.
- Large IP55 rated flame-proof plastic enclosure with space for additional accessories as may be specified.

Dayliff Drytek Electronic Pump Controllers are high specification units that provide comprehensive protection for all pump motors. The combination of extensive built-in functionality that eliminates the need for expensive separate components, a wide application range through easy adjustment and simple operation provides units of great versatility and effectiveness. These features combined with exceptional value results in one of the best pump controllers available.

### CONTROL FUNCTIONS

**Multifunction visualization and programming display**

**Green LED for load activated**

**Multifunction push button**

**Arrow up push button**

**Arrow down push button**

**OK push button**

### GENERAL DATA

Controller Model	Motor Size		Current Range	Dimensions (mm)			Weight (kgs)
	Min	Max		Height	Width	Depth	
<b>DRYTEK 1Ph/2.2kW</b>	0.37kW	2.2kW	2-18Amps	340	240	170	1.5
<b>DRYTEK 3Ph/7.5kW</b>	0.55kW	7.5kW	2-16Amps				2.5
<b>DRYTEK 3Ph/15kW</b>	7.5kW	15kW	16-30Amps				3.5



Dayliff EXPRESS is a high specification multi-function electronic controller suitable for allborehole, waste water, sewage and general water supply pump applications. Controllers are fitted with a digital display that indicates both operating and fault parameters and can be programmed using fascia mounted panel buttons. A range of specifications are available for single and three phase motors, configuration to a particular motor size being effected by adjustments of the maximum running current. Particular features include:

- Incoming mains isolator and door interlock
- Multifunction LCD display of voltage, current, power factor ( $\cos\phi$ ), operating status and system faults
- In built protection for overcurrent, over or under voltage, phase sequence and phase failure.
- In built power factor dry run protection or connections for remote low level float switch/probes provided.
- Connections for various analogue (eg pressure and float switch) or digital (eg PLC's and transducers) signal inputs provided.
- Large enclosure with space for capacitors in single phase pump installations.
- Adjustable maximum operating current and voltage limit settings.
- Twin pump controllers provide for selection of duty/standby, alternate duty cycling with auto trip changeover and parallel operation configurations.

Single and twin pump EXPRESS controllers for DOL start are available as standard while panels for 3 and 4 pump operation and Star-Delta start can be supplied on request.

Dayliff EXPRESS is a fully integrated controller that is adaptable to almost any pump control requirement as well as giving full motor protection and operating and fault status indications. It is compact, simple to install and exceptional value for the functionality provided and the ultimate control solution for all booster pumping requirements.

### CONTROLLER FUNCTIONS

Controller Data	Start Method	Motor Size	Max Current(A)	Dimensions (mm)			Weight (kg)
				H	W	L	
EXPRESS D1-1ph	DOL	0.37-2.2kW	18	320	240	190	2
EXPRESS D1-3ph/7.5	DOL	0.55-7.5kW	16				2.5
EXPRESS D1-3ph/15	DOL	0.55-15kW	32				2.5
EXPRESS D2-1ph	DOL	0.37-2.2kW	18				2.5
EXPRESS D2-3ph/7.5	DOL	0.55-7.5kW	16				3.5

**DAYLIFF** *express D1*

DAYLIFF  
www.dayliff.com

**SINGLE PUMP CONTROLLER**

**230V 7.0A 1.0b**  
PL (L) P2(L) P3 (0) Display of Analogue Signals expressed as a percentage, in meters or Bar

**230V 7.0A 0t**  
PL (L) P2(L) P3 (0) Display of Motor Operating Parameters

**230V 0.0A 1.0**  
MAN ( ) AUR(\*) PL (L) Display of Motor Operating Status

Express D1/D2 - 1ph    Express D1 - 3ph    Express D2 - 3ph

Enclosure Class: IP55

Power Supply: 110V-240V/±10% 1ph, 310V - 450V/±10%, 3ph



**MJ**



**PD**



**WP**

The various Dayliff water meter types are robust and economical designs for monitoring residential, commercial and agricultural consumption. All meters are remote monitoring enabled and pulse cables are available on request. Sizes are available from DN15 to DN100 in three different ranges as follows:-

### MJ

A high precision and reliable multi jet dry type water meter designed for general water supply metering applications. It features magnetic drive for lower transmission resistance, a magnetic shield for external magnetic field protection and a sealed dry dial to ensure clear and easy reading. The body is made from composite plastic for DN15 and DN20 sizes and brass for larger sizes. Meters are supplied with inlet strainers and union connectors.

### PD

Rotary piston type meters that provide high accuracy over a wide flow range. The mechanical transmission movement provides reliability and the liquid sealed register provides easy and clear reading. Meters are fitted with internal strainers, non return valves and union connectors and the bodies are made from composite plastic (15mm size) and corrosion resistant steel for other sizes.

### WP

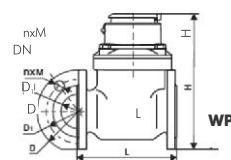
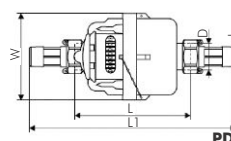
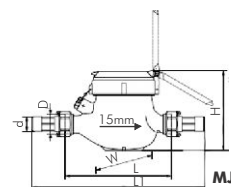
A heavy duty meter with flange connections for bulk flow applications featuring magnetic drive, a dry dial for clear reading and a removable measuring mechanism that can be maintained without removing the meter body. The body is made from cast iron with epoxy coating.

### PERFORMANCE DATA

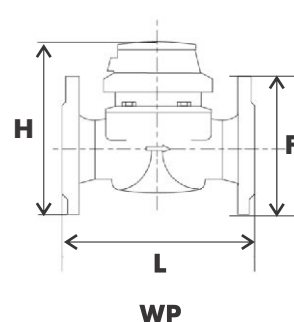
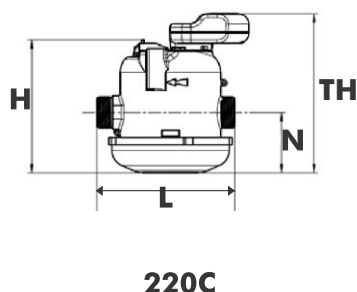
	MJ					PD		WP			
	15	20	25	32	40	15	20	50	65	80	100
Rated Flow (m <sup>3</sup> /hr)	1.5	2.5	3.5	6	10	1.5	2.5	15	25	40	60
Max. Flow (m <sup>3</sup> /hr)	3	5	7	12	20	3	5	30	50	80	120
Min. Flow (l/hr)	30	50	70	120	200	15	25	7.5	12.5	20	30
Pressure Rating (bar)	16	16	16	16	16	10	16	16	16	16	16
Max. Operating Temp (°C)	40	40	40	40	40	40	40	50	50	50	50
Max. Pipe Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	1/2"	3/4"	2"	2 1/2"	3"	4"
Pressure Loss at Rated Flow (bar)	0.2	0.25	0.25	0.24	0.2	0.2	0.25	0.02	0.015	0.034	0.038
Pressure Loss at Max. Flow (bar)	1	1	1	1	0.9	1	1	0.08	0.08	0.015	0.125
Max. Reading (m <sup>3</sup> )	99999.999					9999.9999		999999			
Accuracy Class	B					C		B			

### DIMENSIONS AND WEIGHTS

	MJ					PD		WP			
	15	20	25	32	40	15	20	50	65	80	100
Body thread (D)	3/4"	1"	1 1/4"	1 1/2"	2"	3/4"	1"	-	-	-	-
Connector thread (d)	1/2"	3/4"	1"	1 1/4"	1 1/2"	1/2"	-	-	-	-	-
Flange size (mm)	-	-	-	-	-	-	-	165	185	200	220
Body Length, L (mm)	165	190	260	260	300	115	130	200	200	225	250
Overall Length, L1 (mm)	259	294	380	384	431	209	234	-	-	-	-
Height, H (mm)	106	107	118	118	142	96	96	256	266	276	286
Width, W (mm)	98	98	98	98	122	96	96	165	185	200	220
Weight with connectors (kgs)	0.7	0.8	2.9	3.7	6.1	0.6	1.48	12	13	16	18







Sensus Metering Systems is a new name for one of the world's leading water metering solution providers with a 150-year history and a world-wide presence. The Group has evolved from the merger of a number of world renowned meter manufacturing companies in the USA, Germany, UK and France to offer unmatched choice, technology and quality for all water metering requirements.

Specifically the following products are offered from stock, though many other metering solutions for specialised applications are available to special order.

## 220C

An ultra light and easy to handle piston type meter made from a super strong composite body that increases installation security. The tamper proof design assures accurate reading of water consumed and is resistant to water hammer.

## 405S

A heavy-duty meter designed for water supply metering by utilities and other water providers who demand reliability, accuracy and consistency. The range is of dry dial multijet type with a protected magnetic transmission between the measuring element and the output display. The display is of 8-digit configuration reading to 1 litre and incorporates a rotating indicator disc to show the passage of water.

Special features to ensure reliability include a tubular pre-strainer, specially designed injection box for easy particle passage and sealed dry totalizer. Meter materials includes a brass body and precision moulded plastic metering and totalizer components with plastic totalizer casings for the 15 & 20 sizes and brass for the 30 & 40 sizes.

## WP Range

A specially designed heavy-duty meter for bulk flow applications where reliability, accuracy and long life are demanded. The meter is of woltman type with protected magnetic transmission, IP68 copper/glass register and the output display has a 6-digit m<sup>3</sup> readout with needle indicators for flow to 1 litre. The meter body is constructed of heavy duty cast-iron with flanged connections and the measuring element and rotor of engineering plastic. All WP meters are pre-equipped for remote reading and data logging applications (flow rate, pressure, etc).

## PUMP DATA

MODEL	220C	405S				WP		
Nominal Size (mm)	15	15	20	30	40	50	80	100
Rated Flow (m <sup>3</sup> /hr)	2.5	1.5	2.5	6	10	15	40	60
Max Flow (m <sup>3</sup> /hr)	3	3	5	12	20	90	200	300
Min Flow (litre/hr)	15	30	50	120	200	300	500	800
Pressure Rating (Bar)	16	16	16	16	16	16	16	16
Max Operating Temp (°C)	40	40	40	40	40	50	50	50
Max Pipe Size	1"	1"	1 1/4"	1 1/2"	2"	2 1/2"	4"	6"
Pressure Loss at Rated flow (Bar)	0.18	0.18	0.19	0.24	0.22	0.01	0.02	0.03
Pressure Loss at Max flow (Bar)	0.6	0.6	0.8	0.85	0.6	0.2	0.3	0.5

MODEL	220C	405S				WP		
Nominal Size (mm)	15	15	20	30	40	50	80	100
Meter Thread (D <sub>1</sub> )	3/4" BSP	3/4" BSP	1" BSP	1 1/2" BSP	2" BSP	N/A	N/A	N/A
Meter Thread (D <sub>2</sub> )*	1/2" BSP	1/2" BSP	3/4" BSP	1 1/4" BSP	1 1/2" BSP	N/A	N/A	N/A
Flange Size (F)	N/A	N/A	N/A	N/A	N/A	160	200	250
Length (L)	115	170	190	260	300	200	200	250
Height (H)	110	104	104	142	160	193	205	255
Width	105	82	82	102	136	160	200	250
Weight (kgs)	0.5	0.9	1.1	2.3	4.3	7.7	10.6	15

\* Threaded meters are supplied with union connectors

### PVC BOREHOLE PIPES



Dayliff PVC Borehole pipes are specially designed for all borehole installations being exceptionally strong and having an extremely secure jointing arrangement. Their many benefits include:-

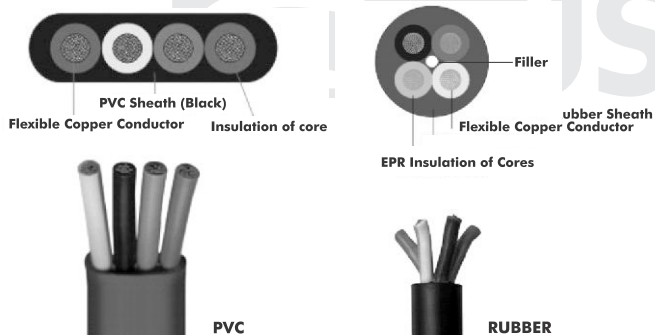
- Made from strong non corroding uPVC for long life
- Deep square thread spigot ends with rubber joint for easy coupling and an assured seal
- Smooth surface finish reduces hydraulic friction and increases pump efficiency
- Very light and easy to handle
- Suitable for water temperatures up to 70°C
- Economical to buy and install

Dayliff PVC Borehole pipes are available in 3m lengths in standard, heavy and super heavy duty specification for different pressure ratings in sizes from 1 1/4" and 3" and all installations include steel pump and well head connectors. For extra deep installations a piping/connector bracing kit is available for additional security. They offer very considerable advantages over traditional steel pipe alternatives and are the ideal solution for all borehole pump installations.

Size		Pipe Outer Diameter (mm)	Outer Diameter over socket (mm)	Wall Thickness (mm)	Ultimate Breaking Load (kg)	Safe Pulling Load (kg)	Max Allowable Pressure (bar)	Safe Total Pump Delivery Head (m)	Weight (3m pipe)	
(mm)	(in)								Pipe only (kg)	Pipe + Water (kg)
32	1 1/4	42	55.5	5	2650	1400	26	250	2	5
38	1 1/2	48	62.5	5.2	3200	1500	26	260	3	6
50	2	60	78.5	6.4	5098	2700	21	200	4	10
50HD*				7.3	5682	3200	27	270	5	11
65	2 1/2	73	92.5	6.6	5934	3600	18	160	5	15
65HD*			94.5	8.7	7432	4000	26	260	6	16
65SHD**	2 1/2	73	94.5	10	9194	4250	35	350	8	18
80SHD**			115	10.5	12000	6500	35	350	10	25

\* Heavy Duty Pipes \*\* Super Heavy Duty Pipes

### SUBMERSIBLE CABLES



Dayliff submersible cables are specially selected for motor power supply in all borehole pumping applications. They are of 4-core type and available in sizes from 1.5 to 25mm, all using plain annealed flexible copper strands as the conductor. All cables are designed for heavy duty use with excellent resistance to oils, chemicals and solvents and are suitable for temperatures up to 40°C. Two types are available, round blue rubber sheathed to HO7RN-F specifications with conductor sheath coloured brown, blue for the blue PVC sheathed flat cable.

Size (mm)	Current rating, (Amps)	Conductor Resistance, (ohms/km)	No of 0.3mm Wires	Rubber Round Cable		PVC Flat Cable		
				Diameter (mm)	Weight/m (kgs)	Thickness (mm)	Width (mm)	Weight/m (kgs)
1.5	14	12.1	22	11.2	0.16	6.0	15.8	0.16
2.5	18	7.4	36	13.0	0.22	6.5	18.0	0.22
4	26	4.95	56	14.9	0.32	7.6	21.0	0.31
6	31	3.3	85	17.5	0.44	7.9	24.3	0.43
10	42	1.91	140	22.6	0.74	9.9	29.7	0.66
16	57	1.21	226	27.1	1.09	11.8	36.0	0.96
25	72	0.78	354	32.7	1.65	14.7	45.1	1.52

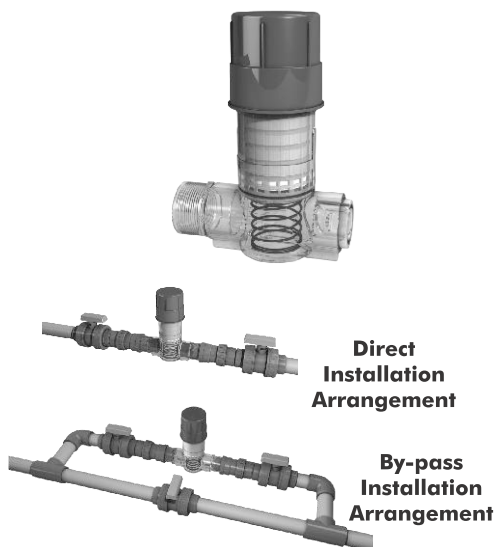
Cable should be sized to limit voltage drop from power source to motor to a maximum of 5%. See table on page 84 for ratings.

### WELL HEADS



Dayliff Well heads are complete units to terminate the top of a borehole. They comprise a strong steel borehole cover plate with dipper access, drop cable/surface cable junction box and pump outlet with valve, test tee, pressure gauge connection and union. They are available as standard in sizes from 1 1/4" to 4" for both 6" and 8" boreholes, though other specifications are available to special order.

### KLORMAN INLINE



Klorman is a simple in-line point of use disinfection system that utilizes a compacted calcium hypochlorite chlorine cartridge which releases active chlorine sanitizer into the water flow. Simple adjustment is provided by varying the projection of the cartridge into the water stream to accommodate different flow rates as well as adjustment of water flow and pressure through the unit. Dosage levels vary with site conditions and treatment water chlorine demand, though sufficient dosage is available to ensure adequate water disinfection.

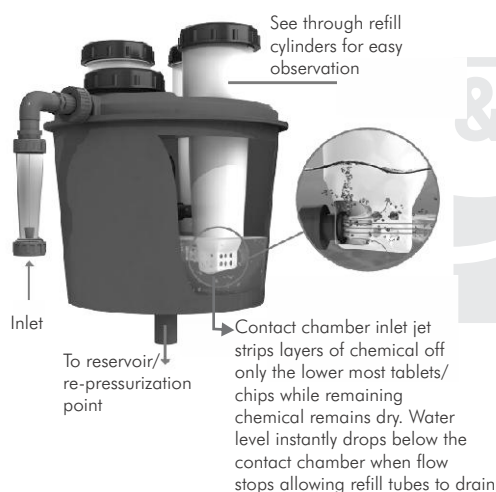
The unit is economical to buy, simple to install, extremely reliable and totally effective and presents the ideal solution for continuous disinfection of household, community, agricultural, sewage and commercial water supplies where constant treatment is required in applications without external power or experienced operators.

**Dosage capacity:** 500m<sup>3</sup> at 1 ppm with no chlorine demand. Capacity varies with flow and installation conditions

**Max flow rate:** 16m<sup>3</sup>/hr

**Max Operating Pressure:** 0.5 to 6 bar (higher pressures are possible in the absence of surge/water hammer)

### KLORMAN 2000



Klorman 2000 is a large capacity disinfection system that works on the simple Klorman principal of releasing active chlorine sanitizer into the passing water flow. Chlorine cartridges in either solid or chip form are suspended in a reservoir through which the untreated water flows in the process being dosed with dissolved chlorine. The units should be connected either inline or a bypass directly before the storage tanks and dosage stops with water flow preventing over-chlorination.

**Dosage Capacity:** 22 kg of full refill tablets will dose 16000m<sup>3</sup> at 1 ppm

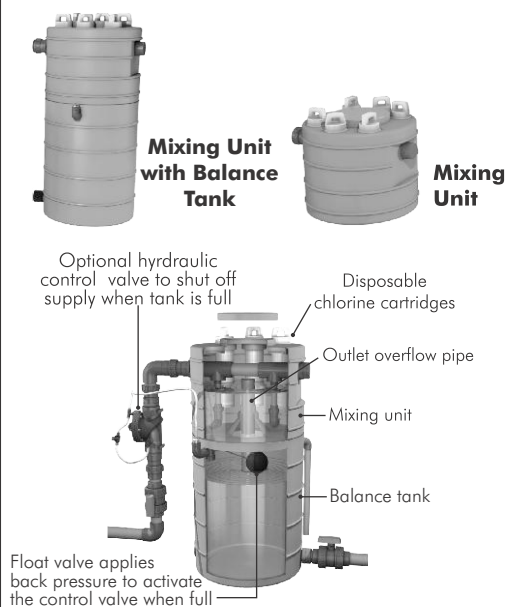
**Maximum Flow Rate through the contact Chamber:** 5m<sup>3</sup>/hr.

**Minimum Flow Rate through the contact chamber:** 0.6m<sup>3</sup>/hr.

**Chlorine Dosage:** 50-350ppm depending on flow rate.

**Maximum inlet Pressure:** 3 bar

### BUCCANEER



Buccaneer is a simple, versatile and effective gravity feed disinfection system that uses compacted calcium hyperchlorite chlorine cartridges for dosing free chlorine into a water flow. The cartridges are suspended in the mixing unit that is fed either directly or from a bye-pass off the main flow and chlorine dosage is effected as the cartridges dissolve. Dosage rate is set by controlling either the flow through the mixing unit or by varying the number of cartridges and cartridges lift in their seats to indicate when used. Typical applications include sewage and waste water effluent, factory washdown, agricultural disinfection, food storage and potable supply.

Outflow from the mixing unit is via an overflow pipe either directly by gravity into a bulk storage tank or optionally the mixing unit can be mounted on a balance tank from which treated water can then be drawn by a pump. In this arrangement it is necessary to fit a float valve operated hydraulic valve, which stops system flow when the outflow ceases.

Buccaneer is the ideal solution for reliable and consistent unmetred chlorine dosage without the need for external power or skilled operators where assured water disinfection is required.

**Dosage Capacity:** Up to 6x1.9kgs refill cartridges will dose 8000m<sup>3</sup> at 1 ppm.

**Water Flow Range:** Up to 7.2m<sup>3</sup>/hr direct flow

**Chlorine Dosage:** 1-250ppm depending on flow rate and cartridge numbers.

**Maximum Inlet Pressure:** 6 Bar

# Borehole Installation & Operating Guidelines

## 1. PUMP SPECIFICATION

A wide range of submersible multistage borehole pumps are offered in various specifications including Grundfos SP and Dayliff DS models that feature stainless steel construction throughout and Pedrollo SR, Dayliff DSP and Dayliff DSD pumps that use engineering plastics for the hydraulic components and feature a floating type impeller that gives superior sand handling capabilities. All pumps use quality materials for construction and provide high efficiency operation and long life.

Pump selection is subject to performance and application, though it is important that the correct model is chosen to suit the characteristics of the borehole as detailed in Section 5. Full pump performance and specification is detailed on the individual Data Sheets.

## 2. PUMP ACCESSORIES

### i) Drop Cable



***Any leakage on the pump tail cable or drop cable will lead to motor failure***

Suitable drop cable selection and attachment is vital to ensure proper pump operation. The following should be noted:-

- Only proper submersible cable of either PVC or rubber type must be used that is specified for permanent water submersion. Other cable types will lead to water ingress and motor failure.
- For single phase pumps 3-core cable is suitable. For three phase pumps 3-core can be used with steel pipes installation using the drop pipe for earthing. 4-core must be used for plastic pipe installations.
- It is important that the correct cable size is selected which is related to motor size and total length. Voltage drop should not exceed 5% from the supply point. The pump supplier should be consulted for the correct cable size.
- The drop cable must be attached to the pump tail cable using a certified cable joint. Leakage at this joint will cause motor failure.
- Care must be taken when fitting the motor tail cable to the motor. The connection between the tail cable and the motor should be lubricated with a non-conducting petroleum jelly and a secure fit made with the securing screws fully tightened.

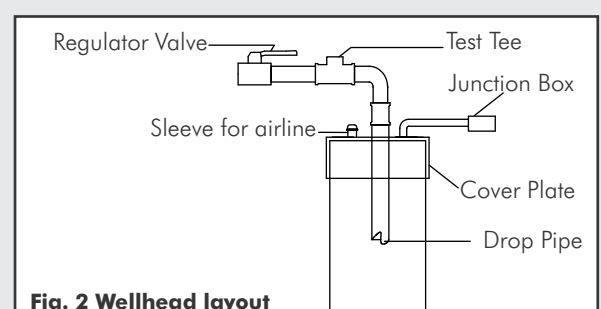
### ii) Riser Pipe

Suitable selection and installation of the riser pipe is essential to avoid the risk of pipe fracture and pump dislodging. This will then require expensive pump removal or possibly borehole loss. The following should be noted:-

- Either MS galvanised steel pipe in 6m or 3m sections or DAYLIFF PVC borehole piping in 3m section should be used for all installations below 50m. For shallow well installations up to 50m single length Polypipe can be used.
- For MS steel pipe ensure that all threads are properly cut and that the connecting sockets are fully threaded. For deep boreholes (deeper than 100m) high tensile 'Crane' type sockets are recommended. Steel pipes are recommended for all 6" pump installations.
- For reasons of reduced friction, ease of installation and economy 'DAYLIFF' PVC borehole pipe are recommended for all 4" pump installations up to 200m depth. Standard PVC piping must never be used.

### iii) Wellhead

A robust sealed wellhead plate should be fitted on the borehole top to prevent borehole contamination, a DAYLIFF wellhead assembly being recommended. The assembly includes a delivery outlet with isolating valve and test tee as well as drop cable entry and optional provision for low-level electrode cables and an airline to measure borehole water depth.



**Fig. 2 Wellhead layout**

### 3. ELECTRICAL CONNECTIONS

#### i) General Information



**Before starting work on the pump, make sure that the electricity supply has been switched off and that it cannot be accidentally switched on.**



**The electrical connection should be carried out by an authorised electrician in accordance with regulations.**



**Correct earthing for all borehole pump installations is essential for safety and pump motor protection. Consult a licensed electrician for advice on requirements.**

- The rated maximum current, supply voltage and  $\cos\phi$  are given on a loose data plate supplied with the pumps which must be fitted close to the installation site.
- The required voltage quality for borehole motors measured at the motor terminals is -10%/+10% of the nominal rated voltage during continuous operation including variations in the supply voltage and cable losses.
- All motors must be fitted with a mains isolator and coarse current protection in the form of an MCB or fuse. Coarse current rating should be approx 3X maximum rated motor current.
- For all three phase motors and single phase motors above 1.1kW a DOL starter is required. Note that starting current is between 4X and 6X the rated motor current which due to the low inertia of a submersible pump is reached in about 0.1 seconds. DOL starting is therefore recommended for motor starting up to 30kW motor sizes as the total system load is less than with a Star Delta alternative. For alternative starting arrangements options of a soft starter or auto transformer starter should be used.
- It is essential to provide motor protection from high/low current conditions outside the limits of +10%, -10% of the rated full load running current, high current protection being provided by a DOL starter overload relay. Also recommended for 3-phase motors is protection against phase loss, phase asymmetry and high/low voltage variations ( $< +10\%$ ,  $> -10\%$ ) of nominal supply voltage which can be provided by a multi-function relay.
- Also generally recommended unless water availability is assured is low level protection to prevent the pump running dry. Conventionally this is provided by a relay connected by cable to sensors in the borehole water, though wireless electronic protection is also available.
- Borehole motors can be used with inverters for power by DC sources, particularly solar modules and also variable speed operation. Further information can be obtained from the pump supplier if there is a particular installation requirement.

#### ii) Single Phase Motors



**Correct connection of terminals and identification of the start, run and common windings is essential or else the motor will burn out. Extra care must therefore be taken when connecting and if in doubt the pump supplier should be consulted.**

All single phase motors are supplied with control units including capacitors and a switch. PSC motors are fitted with one combined start/run capacitor while CS/CR motors are fitted with separate start and run capacitors with a change-over relay. Specifications are as follows:-

Motor Size	Type	Start Capacitor	Run Capacitor
<b>0.37kW</b>	PSC	-	16
<b>0.75kW</b>	PSC	-	25
<b>1.1kW</b>	PSC	-	35
<b>1.5kW</b>	CS/CR	200-250	40
<b>2.2kW</b>	CS/CR	200-250	60

Small single phase motors (up to 1.1kW) are fitted with inbuilt thermal overload protection though for added motor security it is advisable to fit a voltage protection unit such as a Dayliff AVS or alternative Sollatek. For motors larger than 1.1kW a DOL starter is required and this can be provided by a separate DOL contactor and overload unit or alternatively by a DAYLIFF Drytek controller which includes over/under current protection plus multi-function power



input protection and wireless low level protection by  $\cos\phi$  monitoring. Digital indications of operating parameters are also provided including current, voltage and  $\cos\phi$ . For full motor protection a Drytek controller is recommended.

### iii) Three Phase Motors

All three phase motors require DOL starting and overload protection. Drytek controllers as detailed for single phase motors are recommended for enhanced protection and prolonged life.

## 4. SOLAR POWERED BOREHOLE INSTALLATIONS

Solar powered pumping installations are particularly appropriate in remote off-grid sites and are a more economical and reliable solution to alternative generator powered supply. Two types of installations are available:-

- **DC Motor Input** Power is fed directly from the solar modules to the pump through a simple controller, options of Dayliff Sunflo, Grundfos SQFlex and Lorentz PS pumps being available which use special integrated motors that accept DC supply.
- **AC Motor Input** Particularly suitable for large installations are standard AC input motors which are powered through a DC/AC inverter controller. Note that AC input motors require a higher DC voltage output for the modules of about 500VDC and care must be taken to connect the modules appropriately to provide this voltage. Details will be provided by the equipment supplier.

Overall system efficiency is particularly important in solar installations due to the cost of the PV module array and it is essential to optimise the pump/solar array configuration to suit the application. Accurate site parameters must be provided. Both Grundfos and Lorentz provide on-line selection programmes that should be used to specify the equipment and all installations should have the application report available in order to check the efficacy of the installation.

## 5. INSTALLATION

### i) Pump Application

- A wide range of pump models are available and the pump selected must be matched to the borehole output to provide optimal operating performance. This should be done with reference to the borehole drillers report in consultation with a borehole installation specialist. As a rule pump output should not exceed 65% of maximum tested borehole yield.
- Minimum Borehole Diameter 3" pumps-84mm, 4" pumps-110mm, 6" pumps-160mm, though check with the pump data sheet.
- Pumped liquid should be clean, thin and non-explosive containing no solid particles or fibres. Sand content should not exceed 50gm/m<sup>3</sup> or else pump life will be reduced and any warranties will be invalidated.
- Liquid temperature should not exceed 40°C in order to preserve rubber components. Also for high temperatures one motor size larger should be fitted to prolong motor life due to high operating temperatures.

Pumps can be installed either vertically or horizontally, though if installed horizontally the discharge outlet should never fall below the horizontal plane. For all horizontal installations a flow sleeve should be used and also there should be a minimum of 0.5m water depth above the pump to prevent the formation of a vortex.

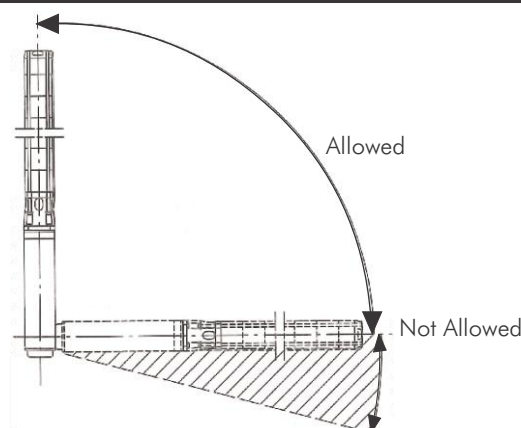


Fig. 3 Pump Axis Limits



## ii) Pump Position

### Borehole Measurement Parameters

- L1.** Minimum installation depth below dynamic water level
- L2.** Depth to dynamic water level (DWL)
- L3.** Depth to static water level (SWL)
- L4.** Draw down. This is the difference between the dynamic and the static water levels
- L5.** Installation depth
- L6.** Distance of pump from well bottom

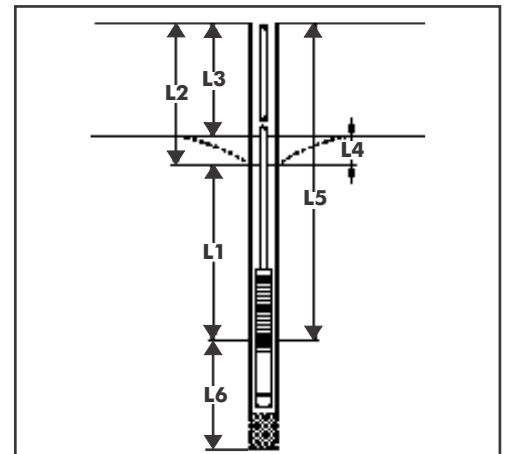


Fig. 4 Borehole Measurements

- When positioning the pump it is important to ensure adequate motor cooling through water flow past the motor. This will be achieved by installing the pump suction above the borehole main aquifer or well screen and if not possible or in cases of open water installation a cooling sleeve must be used. Recommended minimum flow rate past the motor is 0.2m/sec.
- It is recommended that the complete pump is submerged at least 3m below the dynamic water level and if possible the pump should be installed at least 3m from the bottom of the borehole to prevent silting damage. As a rule the pump should be positioned mid-way between the bottom of the borehole and the dynamic water level assuming that the main aquifer is below this level. If in doubt consult the pump supplier.

## ii) Pump Lowering

It is recommended that a fully equipped borehole service vehicle be used for pump lowering and removal in order to minimize risk of pump dislodging. However, for shallow boreholes (less than 50m) a manual tripod arrangement can be used. When moving the pump the following procedures should be followed:-

- Before starting pump lowering it is important to check the borehole depth and straightness to ensure it is as expected and there is unobstructed passage. The pump should be carefully lowered into the borehole and if an obstruction is encountered the pump should be removed and the cause investigated to avoid pump or cable damage.
- Fit the first starter pipe into the pump outlet and ensure a tight leak free joint while the pump is on the surface. The thread on the starter pipe should not be longer than the threads in the pump outlet or it will interfere with operation of the non-return valve.
- Screw the starter pipe into a robust adaptor hook attached to the winch or tripod cable and lower the pump and pipe section into the borehole. When fully lowered hold the pipe below the socket with a clamp, disconnect the lifting hook and attach to the next pipe length ensuring a water tight connection. Ensure the pipe joint is fully home and repeat until all pipes are lowered.
- While the pipes are being lowered bind the drop cable, low level cable (if fitted), and airline (if fitted) to the drop pipes with a PVC cable clip at 2m centres.

## 6. PUMP OPERATION

When the pump has been connected correctly and is submerged in water proceed as follows:-

- First check the direction of rotation by starting the pump and observing a normal water flow. If low or uneven change the direction of rotation by switching two phase connections.
- The pump should then be run with the discharge valve restricted to approximately 1/3 of its maximum volume of water. Observe if there are impurities in the water and then gradually open the valve until the water is observed to be clear. If the water continues to be silted the pump is installed too low in the borehole and it should be raised until it is in a position of clear water availability. Alternatively a borehole problem is indicated and a driller should be consulted.

- As the valve is being opened, the water output should be monitored to ensure that the pump output does not exceed the borehole capacity as indicated by the pump starting and stopping on the low level relay (if fitted) or uneven water flow at the outlet. If this occurs the pump should either be changed to one of suitable specification or throttled on the outlet valve to a sustainable output. Note that the dynamic water level should always be above the suction interconnector of the pump.
- After the water flow settles the pump overload relay should be set. This is carried out by reducing the overload setting to the cutout condition and then increasing by +10%.
- During regular operation the pump operating current should be regularly monitored and if a substantial change is noted ( $\pm 10\%$ ) it should be investigated by a service technician. Pump output should also be monitored and if the flow rate or consistency changes investigations should be made.
- In order to obtain maximum pump life the number of starts should be controlled and should not exceed 30 per hour. It is also necessary to start the pump at least monthly to prevent seizure.

## 7. MAINTENANCE

No regular maintenance is required though periodically, recommended every 3 months, the installation should be inspected to check operating parameters including running current, water output, closed head pump pressure and water quality as well as switchgear condition. Rectification should be carried out as necessary. Interpretations of various operating problems are given in the Fault Finding Guide.

Also important is a periodic check of motor winding and insulating resistance, especially if there is an abnormal operating current or voltage reading. For three phase motors winding resistance between each pair of phases should not exceed 10%. For insulating resistance a satisfactory reading is  $> 100\text{M}\Omega$  and if below this some deterioration in motor winding insulation, cable integrity or cable joint security is indicated. Generally it is satisfactory to keep running the motor until resistance drops to below  $0.5\text{M}\Omega$  when the equipment should be removed and checked.

As a rule periodic lifting and checking of borehole installations is not recommended until an operating fault is noted as equipment is designed for continuous operation for an indefinite period.

## 8. TROUBLE SHOOTING GUIDE

Problem	Possible Cause	Solution
The pump does not run	The fuses are blown	Replace the blown fuses. If the replacements blow too, the electric installation and the submersible drop cable should be checked
	The ELCB or the voltage-operated ELCB has tripped out	Re-set the circuit breaker
	No electricity supply	Contact the power supply provider
	The motor overload has tripped out	Reset the motor starter overload. If it trips again, check the voltage and if normal call service technician
	Motor starter/contactator defective	Repair the motor starter/contactator
	The control circuit has been interrupted or is defective	Check the electric installation
	The dry running protection has cut out the pump due to low water level	Check the water level. If it is in order check the water level electrodes/level switch
	The pumps submersible drop cable is defective	Repair/replace the pump/cable
The pump runs but gives no water	The protection relay has tripped due to power inconsistencies	Contact the power supply provider
	The discharged valve is closed	Open the valve
	No water or very low level in borehole	Increase the installation depth of the pump, throttle the pump or replace it with a smaller model to obtain reduced capacity
	The non-return valve is stuck in its shut position	Pull out the pump and clean or replace the valve
	The inlet strainer is choked up	Pull out the pump and clean the strainer
	The pump unit is defective	Replace or repair the pump
	Pipes are leaking	Replace pipes

The pump runs at reduced capacity	The draw down is larger than anticipated	Increase the installation depth of the pump, throttle the pump or replace it by a smaller model to obtain a smaller capacity
	Wrong direction of rotation	Change direction of rotation
	The valves in the discharge pipes are partly closed or blocked	Check and clean or replace the valves and discharge pipe
	The non-return valve of the pump is partly blocked	Pull out the pump and check or replace the valve
	The pump and the riser pipe are partly choked by impurities	Pull out the pump. Check and clean or replace the pump if necessary
	The pump is defective	Repair or replace the pump
Long period until water flow after start	Leakage in the pipework	Check and repair the pipe work
	Riser pipe leakage	Check and repair riser pipe
Loud noise in the pipework	Pump NRV faulty	Lift pump and rectify NRV
	Water hammer	Fit a surface non-return valve and a diaphragm tank on the surface delivery piping
Mechanical damage to pump and motor	Pump cavitation due to low system head resulting in operation at insufficient pressure	Throttle the pump or replace it with a lower pressure alternative
Frequent starts and stops	The water level electrodes or level switches have not been installed correctly	Adjust the intervals of the electrodes to ensure suitable time between the cutting-in and cutting-out of the pump. If the intervals between stop/start cannot be changed automatically, the pump capacity may be reduced by throttling the discharge valve changed
	The non-return valve is leaking or stuck half open	Pull out the pump and clean or replace the non-return valve
	The pump is oversized for borehole	Increase the installation depth of the pump, throttle the pump or replace it with a smaller model to obtain a smaller capacity

# Conversion Factors

## PRESSURE

### **1 pound per square inch (PSI)**

= 0.103 m head of water  
= 2.31 feet head of water  
= 0.068 Bar

### **1m head of water**

= 3.28 feet head of water  
= 1.42 pound per sq inch  
= 0.097 Bar

### **1 Bar**

= 9.8 m head of water  
= 32.8 feet head of water  
= 14.7 pounds per square inch

## FLOW

### **1m<sup>3</sup>/hr**

= 16.7 litres/min  
= 220 imperial gallons/hr  
= 3.7 imperial gallons/min  
= 277 U.S gallons/hr  
= 4.6 U.S gallons per min

### **Imperial gallons/hr**

= 1.2 U.S gallons/hr  
= 4.5 litres/hr  
= 0.075 litres/min

## VOLUME

### **1 imperial gallon**

= 4.545 litres  
= 0.00455 cubic metre  
= 1.2 U.S gallons  
= 0.16 cubic feet  
= 10 lbs water

### **1 Litre**

= 0.22 imperial gallons  
= 0.18 U.S gallons

### **1 Cubic Meter**

= 20 imperial gallons  
= 264 U.S gallons  
= 2200 pounds water  
= 35.31 cubic feet

## WEIGHT

### **1 tonne**

=1000 kas  
=2200 lbs

### **1 ton**

= 1020 kas  
= 2240 lbs  
= 20 cwt

### **1 Ka**

= 2.2 lbs  
= 35.3 ozs  
= 1000 gms

### **1 lbs**

= 160 ozs  
= 454 gms  
= 0.454kas

## DISTANCE

### **1 meter**

= 3.28 ft  
= 39.4 ins  
= 100 cms

### **1 foot**

=30.5 cms

### **1 km**

= 1000 m  
= 0.621 miles

### **1 mile**

= 1.61 kms  
= 5280 ft

## SQUARE MEASURE

### **1 acre**

= 4840 sq vlds  
= 0.405 hectares

### **1 hectare**

= 10,000 sq m  
= 2.47 acres

## TEMPERATURE

Water boils at 100°C or 212°F

Water freezes at 0°C or 32°F

Centigrade = (F-32) x  $\frac{5}{9}$

Fahrenheit = (C x  $\frac{9}{5}$ ) + 32

## POWER

### **1 H.P**

= 746 watts  
= 33,000 ft. lbs per min  
= 550 ft. lbs per second

## CIRCLE FORMULAE

Circumference =  $\pi D$

Area =  $\pi D^2 \times \frac{1}{4}$

Surface area of a sphere =  $\pi D^2$

Volume of cylinder =  $\pi D^2 H \times \frac{1}{4}$

Volume of a sphere =  $\frac{1}{6} \times \pi D^3$

Volume of a cone =  $\frac{1}{3} \pi D^2 H \times \frac{1}{4}$

D = diameter

H = height

$\pi = 3.14$

# Data Tables

**TABLE 1: PVC AND GI FRICTION LOSS TABLES**

HEAD LOSS IN METRES PER 100m FOR DIFFERENT CLASSES OF PVCAND GI PIPES																												
Flow (m³/hr)	¾"			1"			1¼"			1½"				2"				2½"				3"						
	PVC		GI	PVC	GI		PVC	GI		PVC			GI		PVC		GI		PVC		GI	PVC				GI		
1	D	E		D	E		D	E		C	D	E		C	D	E		C	D	E		B	C	D	E			
1.5	2.4	3.2	8.0			1.9			1.5																			
2	5.0	6.8	17.8	1.6	2.2	4.2			2.6																			
2.5	8.6	11	31.9	2.8	3.8	7.5	1.3	1.8	3.9				1.5															
3	12.9	17.4	49.8	4.2	5.7	11.6	2.0	2.7	5.7				2.3															
3.5	19.0	25.8	71.7	6.2	8.4	17.7	2.7	3.7	8.0	1.2	1.4	1.9	3.3															
4				8.5	11.6	25.2	3.5	4.7	10.3	1.5	1.8	2.4	4.3				1.0											
5				10.8	14.8	32.7	4.9	6.7	15.5	2.2	2.6	3.5	6.3				1.5											
6				15.5	21.3	50.5	6.9	9.3	21.7	3.1	3.6	4.9	9.0	1.0	1.2	1.6	2.1											
7				21.6	29.6	72.7	9.2	12.2	29.3	4.1	4.7	6.5	12.3	1.4	1.6	2.2	2.9											
8				28.8	41.8	98.9	11.5	15.6	38.8	5.1	5.9	8.1	15.6	1.7	2.0	2.7	3.7				1.2							
9							14.4	19.6	49.1	6.4	7.5	10.2	20.0	2.1	2.5	3.4	4.7				1.6							
10							17.5	23.8	60.7	7.8	9.0	12.4	24.6	2.6	3.0	4.1	5.8				1.9							
12									33.3	87.4	10.8	12.6	17.3	35.3	3.6	4.2	5.8	8.4	1.2	1.4	1.9	2.7				1.1		
14										14.3	13.9	22.9	48.3	4.8	5.6	7.6	11.5	1.6	1.8	2.5	3.7					1.5		
16										18.3	25.9	29.3	63.0	6.1	7.2	9.8	16.2	2.0	2.3	3.2	5.0					2.0		
18														7.6	8.9	14.4	20.9	2.5	2.9	4.0	6.3	1.0	1.0	1.3	1.8	2.5		
20														9.2	10.8	18.7	25.6	3.0	3.5	4.9	7.6	1.2	1.4	1.6	2.2	3.1		
				2"					2½"					3"					4"					6"				
PVC				GI	PVC				GI	PVC				GI	PVC				GI	PVC				GI				
C				D	E		C	D	E		B	C	D	E		B	C	D	E		B	C	D					
20					9.2	10.8	18.7	25.6	3.0	3.5	4.9	7.6	1.2	1.4	1.6	2.2	3.1											
25					13.9	16.2	28.7	37.3	4.5	5.3	7.4	12.0	1.8	2.1	2.4	3.3	4.8					1.1						
30									6.4	7.5	10.4	17.2	2.5	2.9	3.4	4.7	6.9					1.7						
35									8.5	9.9	13.8	23.2	3.4	3.8	4.5	6.2	9.3	1.0	1.1	1.3	1.8	2.3						
40									10.9	12.5	17.7	30.3	4.3	4.9	5.8	8.0	2.2	1.2	1.4	1.7	2.3	2.9						
45									13.6	16.3	22.0	38.2	5.4	6.1	7.2	9.9	15.4	1.5	1.8	2.1	2.9	3.7						
50														7.5	9.2	12.0	19.0	1.9	2.2	2.5	3.5	4.6						
60														10.7	13.1	17.2	27.6	2.7	3.1	3.8	5.0	6.5						
70														14.3	17.8	23.0	37.3	3.6	4.1	4.8	6.7	8.8				1.2		
80														17.8	23.3	28.8	48.7	4.5	5.2	6.1	8.4	11.5				1.5		
90																		5.6	6.5	7.6	10.9	14.6				1.9		
100																		6.8	7.9	9.2	13.5	18.0	1.0	1.2	1.4	2.4		
120																		9.5	11.0	13.6	19.5	25.9	1.4	1.7	1.9	3.4		
140																							1.9	2.2	2.6	4.7		
160																							2.4	2.8	3.3	6.3		
180																							3.0	3.5	4.1	7.9		
200																							3.6	4.2	5.0	9.5		
225																							4.5	5.3	6.2	11.4		
250																							5.5	6.4	7.8	15.0		



**TABLE 2: GI PIPE SPECIFICATIONS**

NOMINAL BORE (inch)	OUTSIDE DIAMETER (mm)	WALL THICKNESS (mm)			WEIGHTS (kgs per metre)			MAXIMUM WORKING PRESSURES (m)		
		CLASS A	CLASS B	CLASS C	CLASS A	CLASS B	CLASS C	CLASS A	CLASS B	CLASS C
1/2	21.4	2.0	2.6	3.3	1.0	1.2	1.5	100	200	250
3/4	27.0	2.3	2.9	3.7	1.4	1.8	2.1	100	200	250
1	34.1	2.6	3.3	4.1	2.0	2.5	3.0	100	200	250
1 1/4	42.9	2.6	3.7	4.5	2.6	3.5	4.2	85	175	200
1 1/2	48.4	2.9	4.1	4.9	3.3	4.5		85	175	200
2	60.3	2.9	4.1	4.9	4.2	5.7	6.7	70	140	175
2 1/2	76.2	3.3	4.5	5.4	5.9	8.0	9.5	70	140	175
3	88.9	3.3	4.5	5.4	7.0	9.5	11.2	70	140	175
4	114.3	3.7	4.5	5.4	10.2	12.3	14.7	55	100	140
5	139.7		4.5	5.4		15.3	18.2		100	140
6	165.1		4.5	5.4		18.3	21.8		85	100


**TABLE 3: PVC PIPE SPECIFICATIONS**

NOMINAL DIAMETRE (mm)	OUTSIDE DIAMETRE (mm)	WALL THICKNESS (mm)				PER 6 METRE EFFECTIVE LENGTH				IMPERIAL SIZE (inch)
		CLASS B	CLASS C	CLASS D	CLASS E	CLASS B	CLASS C	CLASS D	CLASS E	
D25	25.2			1.6	1.8				1.2	3/4
D32	32.0		1.6	1.9	2.35			1.6	1.9	1
D40	40.2		1.8	2.4	2.85		1.9	2.5	3.0	1 1/4
D50	50.2	1.6	2.2	2.9	3.5	2.1	3.0	3.8	4.6	1 1/2
D63	63.2	1.9	2.8	3.6	4.45	3.3	4.7	6.1	7.4	2
D75	75.2	2.2	3.3	4.2	5.15	4.6	6.7	8.5	10.2	2 1/2
D90	90.2	2.7	3.9	5.1	6.2	6.7	9.6	12.2	14.8	3
D110	110.2	3.3	4.8	6.1	7.55	10.0	14.3	18.4	22.2	4
D160	160.3	4.7	6.8	8.9	10.95	29.5	42.2	54.9	66.4	6
D200	200.3	5.2	7.6	10.0	12.3	37.6	53.7	69.1	83.9	7

**NOTE:** Maximum Pressure Ratings

Class B = 6 Bar

Class D = 12 Bar

Class C = 9 Bar

Class E = 15 Bar

**TABLE 4: MOTOR CURRENT RATINGS, OVERLOAD & CIRCUIT BREAKER SIZES**

MOTOR SIZE		SINGLE PHASE 240V			THREE PHASE 415V				
kw	HP	Max Full Load Current (A)	O/L Rating (A)	C/B Rating (A)	Max Full Load Current (A)	Direct On Line		Star/Delta	
						O/L (A)	C/B (A)	O/L (A)	C/B (A)
0.37	0.5	3.5	2.5 - 4	6					
0.75	1.0	6.0	5.5 - 8	10					
1.10	1.5	8.8	7 - 10	15	2.7	2.5 - 4	6		
1.50	2.0	11.0	9 - 13	16	3.6	2.5 - 4	6		
2.20	3.0	17.0	12 - 18	25	5.3	4 - 6	10		
3.70	5.0				8.4	7 - 10	16	4 - 6	16
5.50	7.5				12.0	9 - 13	16	5.5 - 8	16
7.50	10.0				16.0	12 - 18	20	7 - 10	20
11.20	15.0				23.0	17 - 25	32	9 - 13	32
15.00	20.0				29.0	23 - 32	40	12 - 18	40
18.50	25.0				36.0	28 - 36	50	17 - 25	50
22.00	30.0				42.0	37 - 50	63	17 - 25	63
30.00	40.0				56.0	48 - 65	80	23 - 32	80
37.00	50.0				69.0	55 - 70	100	30 - 40	100
45.00	60.0				82.0	80 - 125	125	37 - 50	125
55.00	75.0				100.0	80 - 125	175	48 - 65	175
75.00	100.0				134.0	100 - 160	225	63 - 80	225

**NOTE:** O/L = Overload      C/B = Circuit Breaker

**TABLE 5: CABLE CURRENT CAPACITY AND VOLTAGE DROP DATA**

CONDUCTOR OR SIZE (mm <sup>2</sup> )	MULTICORE AMOURED PVC INSULATED CABLE (PVC-SWA)				TWIN AND MULTICORE PVC INSULATED CABLE			
	Two core cable Single Phase supply		Three or four core cable Three phase supply		Two core cable Single phase supply		Three or four core cable	
	Max current capacity (A)	Voltage drop per amp per metre (mv)	Max current capacity (A)	Voltage drop per amp per metre (mv)	Max current capacity (A)	Voltage drop per amp per metre (mv)	Max current capacity (A)	Voltage drop per amp per metre (mV)
1.5	22	29.00	19	25.0	19.5	29.00	17.5	25.0
2.5	31	18.00	26	15.0	27	18.00	24	15.0
4.0	41	11.00	35	9.5	36	11.00	32	9.5
6.0	53	7.30	45	6.4	46	7.30	41	6.4
10.0	72	4.40	62	3.8	63	4.40	57	3.8
16.0	97	2.80	83	2.4	85	2.80	76	2.4
25.0	128	1.75	110	1.5	112	1.75	96	1.5
35.0	157	1.25	135	1.1	138	1.25	119	1.1
50.0	190	0.94	163	0.81	168	0.94	144	0.81

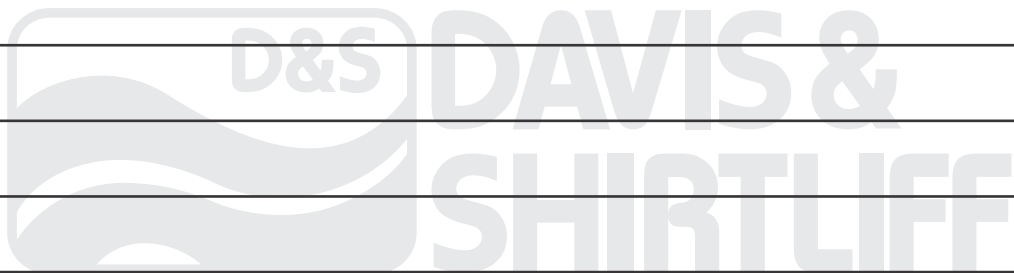
**TABLE 6: BOREHOLE DROP CABLE SIZING**

	MOTOR SIZE		FULL LOAD CURRENT	MIN. CABLE SIZE	CABLE DIMENSION						
					1.5mm <sup>2</sup>	2.5mm <sup>2</sup>	4mm <sup>2</sup>	6mm <sup>2</sup>	10mm <sup>2</sup>	16mm <sup>2</sup>	25mm <sup>2</sup>
	kW	HP	A	mm <sup>2</sup>	MAXIMUM LENGTHS FOR SUBMERSIBLE BOREHOLE CABLE (m)						
ONE PHASE	0.37	0.5	3.5	1.5	180						
	0.55	0.75	5.0	1.5	121	202					
	0.75	1.0	6.7	1.5	91	152	243				
	1.10	1.5	7.2	1.5	63	105	168	252			
	1.50	2.0	10.6	1.5	49	81	130	195	326		
	2.25	3.0	15.8	2.5		56	89	134	223		
THREE PHASE	1.10	1.5	3.1	1.5	382	636					
	1.50	2.0	3.9	1.5	303	505					
	2.25	3.0	5.5	1.5	210	350					
	3.75	5.0	8.7	1.5	131	218	349				
	5.63	7.5	13.0	2.5		155	248	372			
	7.50	10.0	17.2	2.5			184	276	460		
	11.30	15.0	24.0	4.0			126	190	316	505	
	15.00	20.0	32.0	4.0			95	142	237	308	
	18.80	25.2	40.0	6.0				114	190	304	
	22.00	30.0	46.0	10.0					164	262	380
	26.00	35.0	57.5	10.0					133	210	317
	30.00	40.0	66.5	16.0						180	275
	37.00	50.0	80.0	16.0						150	228

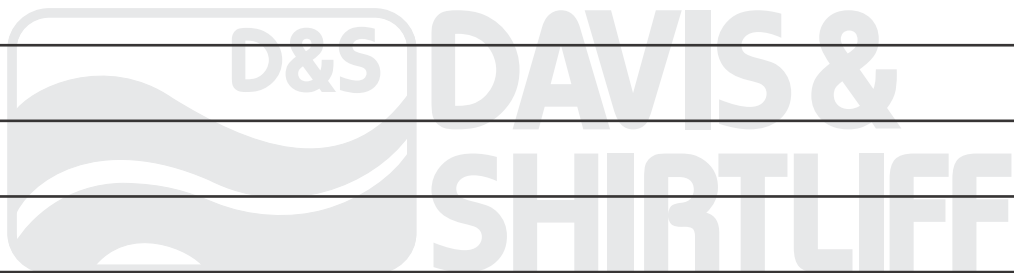
**TABLE 7: ARMoured CABLE SPECIFICATIONS**

NOMINAL CONDUCTOR AREA (mm <sup>2</sup> )	THREE CORE - ARMoured - 600/1000 VOLT CABLE Cable having stranded copper conductors				FOUR CORE - ARMoured - 600/1000 VOLT CABLES Cable having stranded copper conductors			
	MAXIMUM RESISTANCE PER 1000m OF:		OVERALL DIAMETER (mm)	WEIGHT PER METRE (kg)	MAXIMUM RESISTANCE PER 1000m OF:		OVERALL DIAMETER (mm)	WEIGHT PER METRE (kg)
	Conductor (ohm)	Armour (ohm)			Conductor (ohm)	Armour (ohm)		
1.5	12.10	10.2	12.3	0.3	12.10	9.5	13.0	0.7
2.5	7.28	8.8	13.6	0.4	7.28	7.9	14.5	0.7
4.0	4.61	7.0	15.8	0.6	4.61	4.6	17.8	0.8
6.0	3.08	4.6	18.0	0.7	3.08	4.1	19.2	0.9
10.0	1.83	3.7	21.2	1.0	1.83	3.4	22.8	1.3
16.0	1.15	3.8	20.6	1.1	1.15	2.6	23.9	1.5
25.0	0.727	2.4	25.0	1.7	0.727	2.1	27.8	2.1
35.0	0.524	2.1	27.3	2.1	0.524	1.9	30.5	2.6
50.0	0.387	1.9	30.5	2.6	0.387	1.3	35.4	3.4

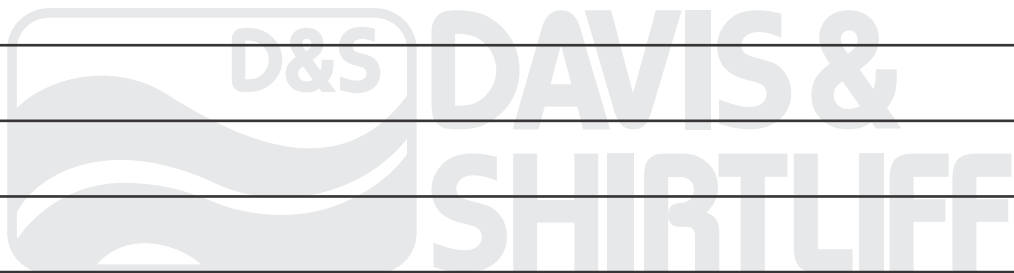
# Notes



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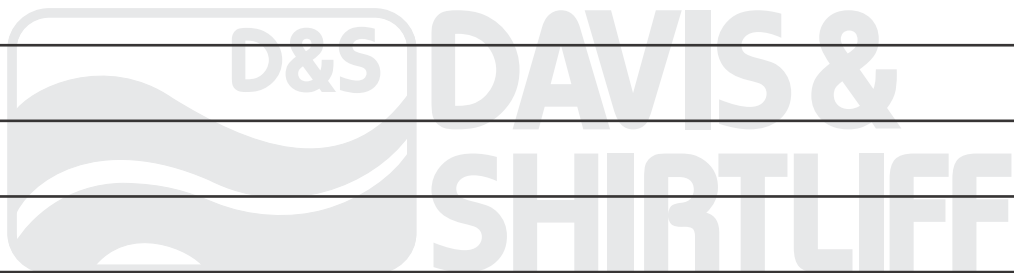


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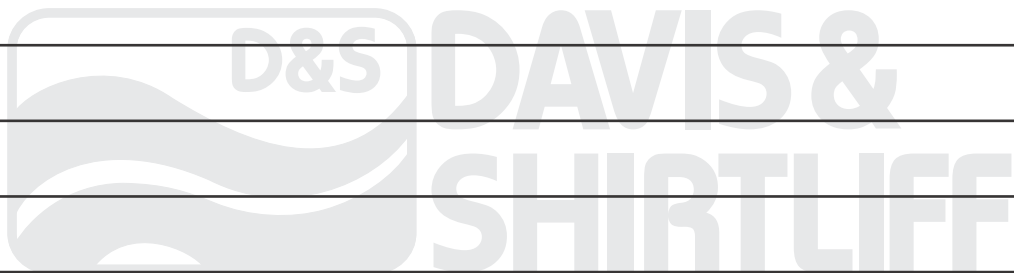




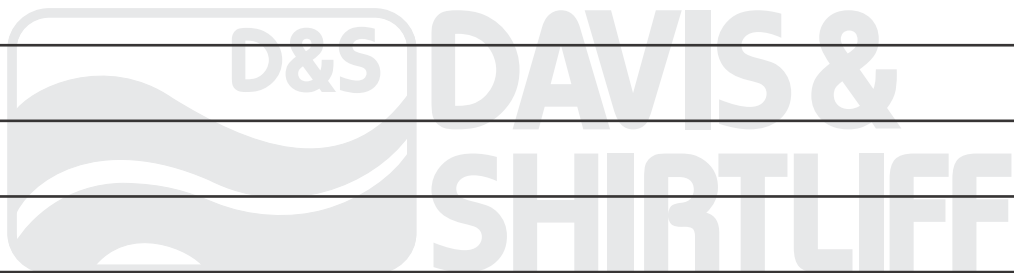
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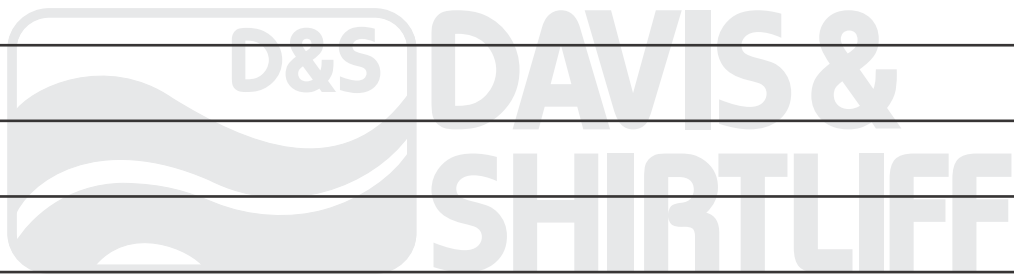
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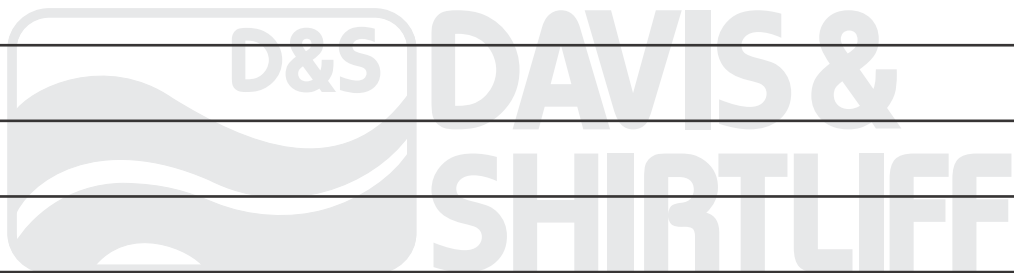
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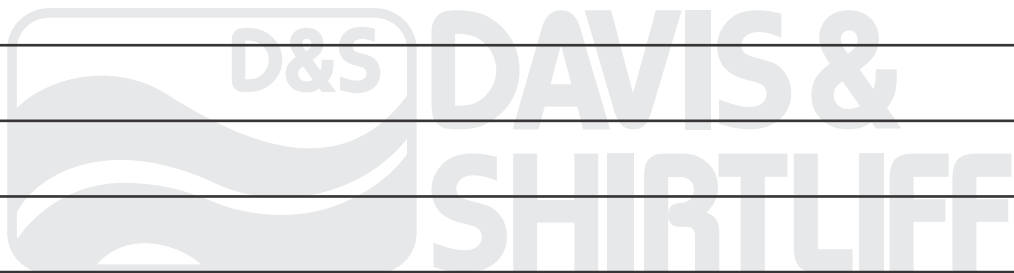
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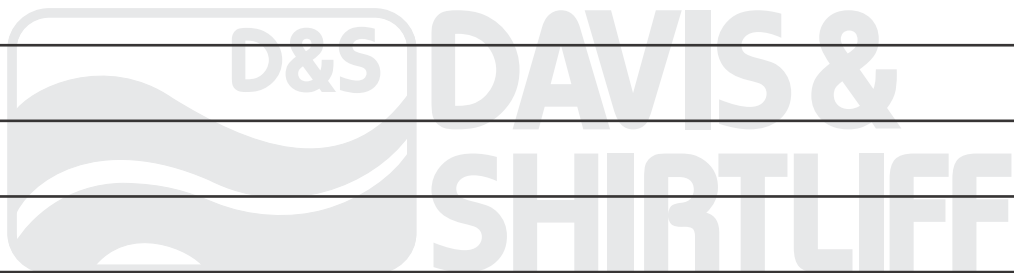


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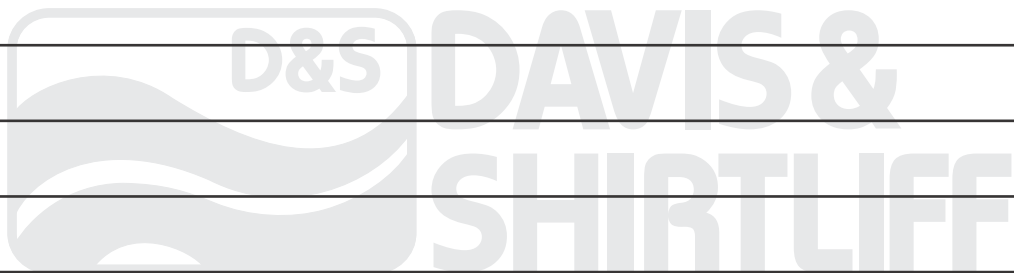




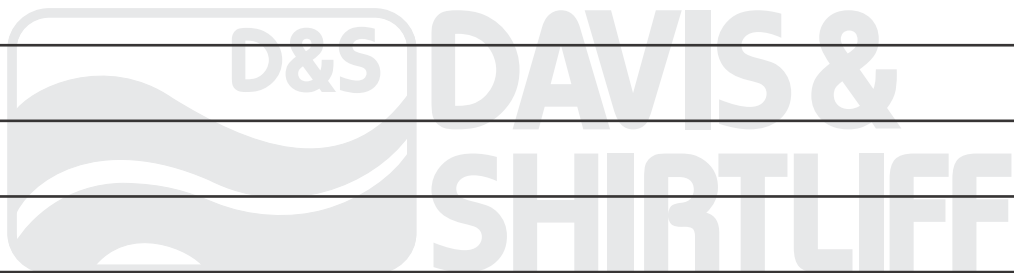
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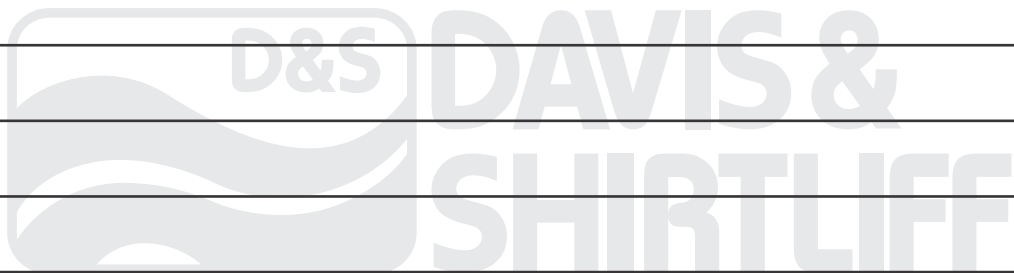
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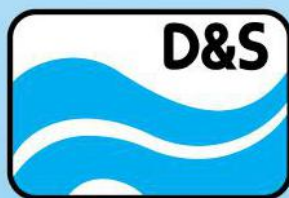


# Notes



# Notes





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