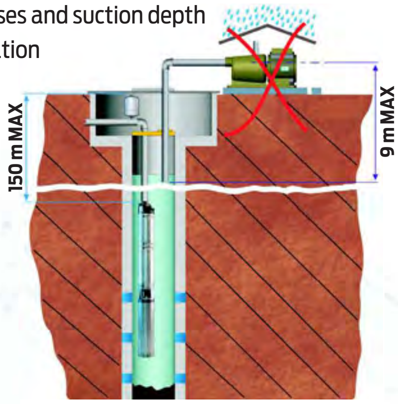
WHY A ZDS COMPLETE SOLUTION?

- Lower energy consumption
Example: a complete solution (ZDS pump curve 3-9, depth of water: 6 m, flow pressure: 40 m, delivery: 40 l/min) uses 40% less energy than a jet pump of equal performance.
- No need for protection against atmospheric agents
- No freezing
- No problem with friction losses and suction depth
- No need for external installation
- Completely silent
- No danger of electric shock
- Easy to install
- Best hydraulic performance
- Protection against any hydraulic and electrical problem



Basic instructions for the correct selection of a submersible pump:

1. Delivery (Q)

When you select a submersible pump and you do not know the real delivery of the borehole, we recommend that you consider the smallest quantity of water that is necessary for that installation (Q = delivery of water). If the quantity of water you draw is bigger than the one that the borehole can deliver, the borehole itself might be damaged, even if the dry running protection of the pump is activated.

To help in the selection of the correct delivery meeting your needs, we are going to list some extracts from the most popular European technical literature.

Please consider that some studies show that the average per capita demand (related only to domestic use) calibrated on the current living standards of the population is approximately 150÷200 l/inhabitant per day.

Looking at animals instead, studies show the following:
Large animals – cows and horses.. 100 l/day
Medium animals – goats and pigs.. 50 l/day
Small animals – chickens..5 l/day
Regarding irrigation and other possible uses of water instead, it is necessary to consider the data provided by the manufacturer of the plant or equipment.

RUNNING BEYOND THE PERFORMANCE CURVE COULD DAMAGE THE PUMP

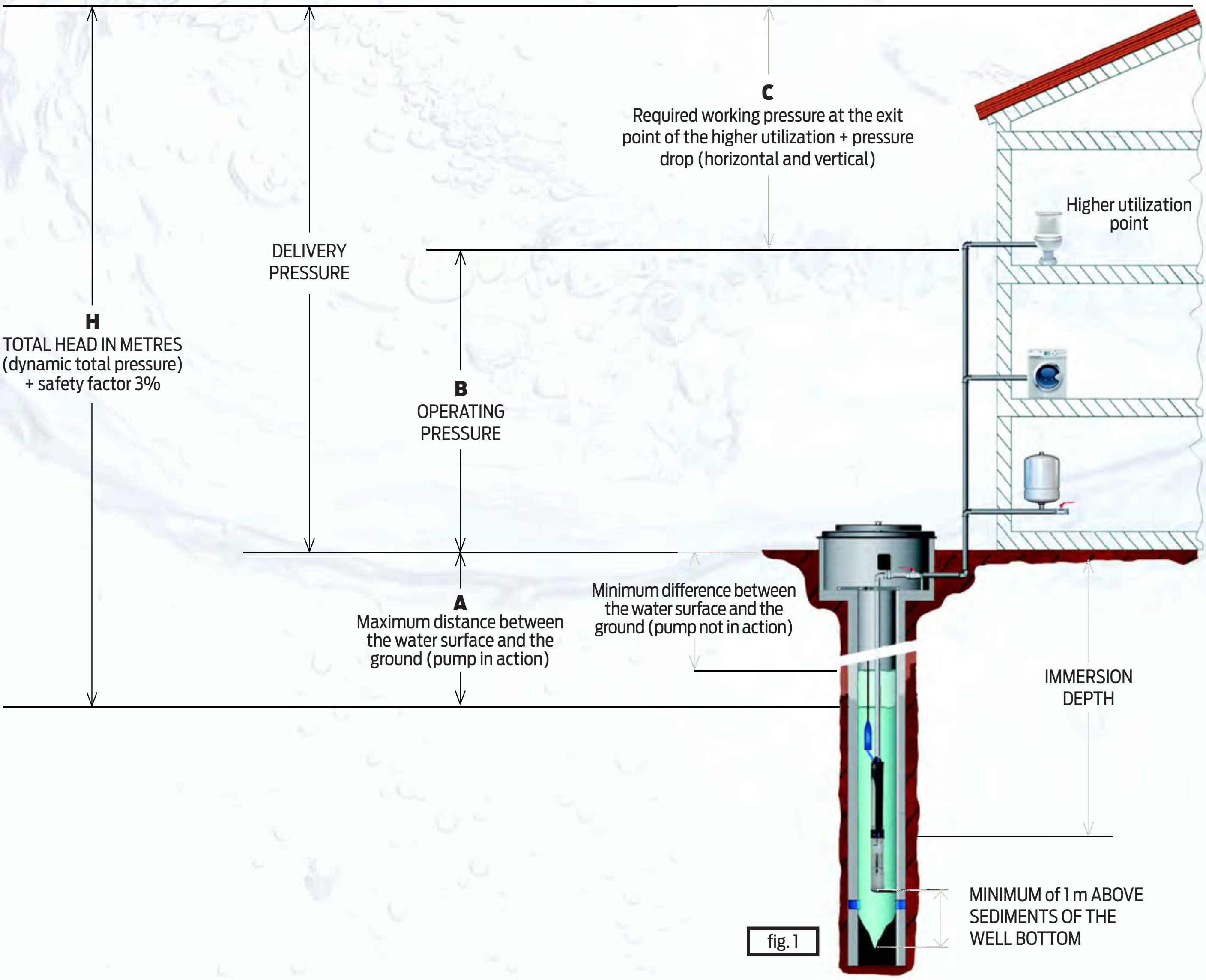


fig. 1

2. Pressure

In order to ensure the correct operating working pressure to the highest point of the plant, we advise you to make the calculation following described criteria for the determination of the pressure required by the pumps: **H = A + B + C** (see fig. 1)

H: Total Head, total dynamic pressure + safety factor 3%
A: maximum difference between the water surface and the ground with pump in action
B: distance from the ground to the highest point of use
C: pressure required to the highest point of use + head losses (fig. 2)

The total dynamic pressure (H) refers to the minimum pressure guaranteed. It may be influenced by the dynamic water level of the well, caused by the variation of the groundwater while the pump is running. In this case it is necessary to calculate correctly the dynamic water level of the well in order to avoid too much pressure for the user. As far as it relates to irrigation and other possible uses of water instead, it is necessary to consider the data provided by the manufacturer of the plant or equipment.

Losses in mt for every 100 mt of rectilinear pipeline of a selected nominal diameter

Material		Galvanized steel	Polyethylene PE 100		Galvanized steel	Polyethylene PE 100		Galvanized steel	Polyethylene PE 100		Galvanized steel	Polyethylene PE 100		Galvanized steel	Polyethylene PE 100	
DN (mm) External diameter		25	32		32	40		40	50		50	63		65	75	
Nominal Ø		1"			1" 1/4			1" 1/2			2"			2" 1/2		
Internal Ø (mm)		27	PN16 26	PN25 23.2	35.8	PN16 32.6	PN25 29	41.3	PN16 40.8	PN25 36.2	52.5	PN16 51.4	PN25 45.8	68	PN16 61.4	PN25 54.4
Delivery (Q) m³/h	l/min															
0.6	10	0.7	0.5	0.9	0.2	0.2	0.3	-	-	0.1	-	-	-	-	-	-
0.9	15	1.6	1.1	1.9	0.4	0.4	0.6	0.2	0.1	0.2	-	-	-	-	-	-
1.2	20	2.6	1.8	3.2	0.7	0.6	1.1	0.4	0.2	0.4	-	-	-	-	-	-
1.5	25	3.8	2.9	5.0	1.0	1.0	1.7	0.5	0.3	0.6	0.1	-	0.1	-	-	-
1.8	30	5.3	4.0	6.9	1.4	1.3	2.3	0.7	0.4	0.8	0.2	0.1	0.2	-	-	0.1
2.1	35	6.9	5.2	9.1	1.8	1.7	3.1	0.9	0.6	1.0	0.3	0.2	0.3	-	-	0.1
2.4	40	8.8	6.8	11.9	2.3	2.3	4.0	1.2	0.8	1.4	0.4	0.3	0.4	-	0.1	0.2
3.0	50	13.1	10.1	17.6	3.4	3.4	5.9	1.7	1.1	2.0	0.5	0.4	0.6	0.1	0.15	0.3
3.6	60	18.3	14.3	24.9	4.7	4.7	8.4	2.4	1.6	2.8	0.8	0.5	0.9	0.2	0.2	0.4
4.2	70	24.2	19.1	33.3	6.2	6.3	11.2	3.1	2.2	3.8	1.0	0.7	1.2	0.3	0.3	0.5
4.8	80	30.9	24.2	42.1	7.9	8.0	14.2	4.0	2.7	4.8	1.3	0.9	1.5	0.3	0.4	0.7
5.4	90	38.3	30.2	52.7	9.8	10.0	17.8	4.9	3.4	6.0	1.6	1.1	1.9	0.4	0.5	0.8
6.0	100	46.5	36.9	-	11.9	12.3	21.7	6.0	4.1	7.4	1.9	1.3	2.3	0.5	0.6	1.0
7.5	125	-	55.3	-	17.9	18.4	32.5	9.0	6.2	11.0	2.8	2.0	3.5	0.8	0.8	1.5
9.0	150	-	-	-	25.1	25.8	45.7	12.5	8.7	15.5	3.9	2.8	4.9	1.1	1.2	2.1
10.5	175	-	-	-	33.3	34.4	-	16.7	11.6	20.7	5.2	3.8	6.6	1.5	1.6	2.8
12.0	200	-	-	-	42.8	43.9	-	21.4	14.7	26.4	6.6	4.8	8.4	1.9	2.0	3.6
15.0	250	-	-	-	-	-	-	32.3	22.3	40.0	10.0	7.3	12.7	2.8	3.1	5.5
18.0	300	-	-	-	-	-	-	44.5	30.5	57.5	13.8	10.2	17.8	3.9	4.3	7.7
21.0	350	-	-	-	-	-	-	59.1	40.5	-	18.4	13.5	23.6	6.7	5.7	10.2
24.0	400	-	-	-	-	-	-	-	52.0	-	23.6	17.3	30.3	10.0	7.3	13.1

fig. 2

We recommend to install a proper cooling jacket in installations bigger than 10 cm, to guarantee the correct motor cooling flow.
Please check the example of installations for each product.
For every pipe curve 90º or valve you need to add losses: 0,18 m
For every check valve you need to add losses: 0,5 m
If possible we recommend not to exceed 15 m losses in 100 m of pipeline
For internal diameter of polyethylene pipeline we consider PE100 UNI 10910

Tips and useful information:

- It is recommended to match the required hydraulic performance with the most efficient point of the pump.
- It is not recommended to use a pipe with a smaller diameter than the pump outlet connector (1”¼ G for series from 1 to 5, 2” G for series 8-10). In any case head losses must be considered in relation to any diameter of the discharge pipe (see fig.1-2).
- The section of the cable must be correctly chosen in relation to the required length and the power of the selected Complete Solution.
- If using a generator, it is necessary that its power is three times the rated power in kW of the submersible pump. In any case ZDS Complete Solutions with DRP can be protected against electrical faults using SLP (see page 30).
- To complete the plant it is recommended to install the accessories offered by ZDS (from page 31).

3. Examples of selection of a submersible pump

1) Let's consider a rural house with 2 apartments with 11 points of use. The estimated water needed for the user is 40 l/min, taking into account the factor of simultaneous use. There are also 50 units of poultry, 15 pigs and 5 cows and 3 points of dispensing water for estimated water requirement of 35 l/min.
If we estimate that the entire system requires 75 l/min of water delivery Q (according to a prudential estimate), we calculate the necessary pressure needed by the user considering that:

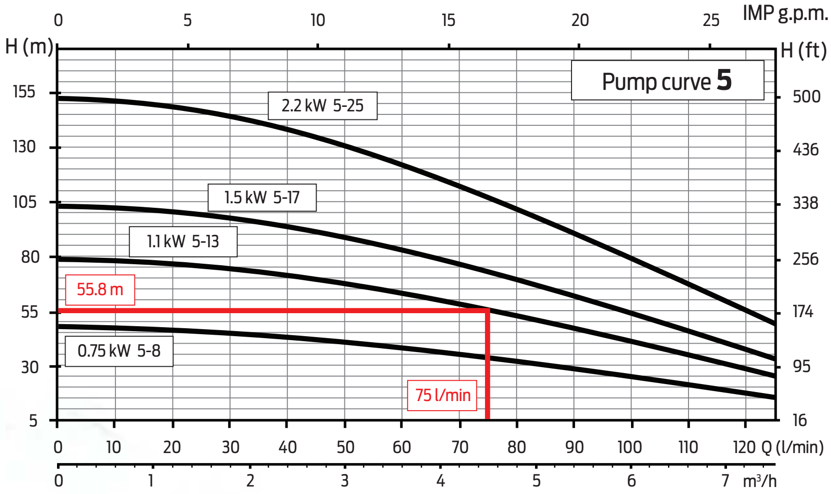


fig. 3

-A: the maximum difference between the water surface and the ground with pump in action is 17 m
-B: the height from the ground to the highest point of use is 9 m
-C: a working pressure of 20 m of water column (2 bar) is required at the highest point and the head losses, appear to be equal to 8,20 m

These losses have been calculated considering that:
- the entire pipeline of 1"¼ in polyethylene is in PE100 and PN16
- submersible pump installation depth is 17 m
- the installation depth of the pump is 9 m
- the length of the horizontal pipe from the well to the building is 80 m

The total length of the pipeline then generates approximately 7,66 m of loss. In addition, the plant has three 90º bends that add an additional 0,54 m of loss.

In our example we calculate **H = A + B + C** where the total height (H) results in 55,8 m (sum of 17+9+20+8,20 + an additional 3% which is 1,63 m given by the prudential factor). To select the pump that will satisfy these hydraulic performances you have to evaluate the curves, depending on the required delivery. In this specific example we need 75 l/min of water and series 5 meets this requirement of delivery at the best efficiency point. Among the pumps from series 5, model 5-13 of 1.1 kW meets the requirement of H = 55,8 m.

PS. The calculation excludes the contribution of pressure due to the dynamic level of the well.

2) Consider now that in a tourist village there are 15 bungalows, 1 point of comfort, some showers, for a total of 100 points of use. The estimated water requirement is 120 l/min taking into account the factor of simultaneous use. If we calculate that the entire system requires 120 l/min of water delivery Q (according to a prudential estimate), we calculate the necessary pressure needed by the user considering that:

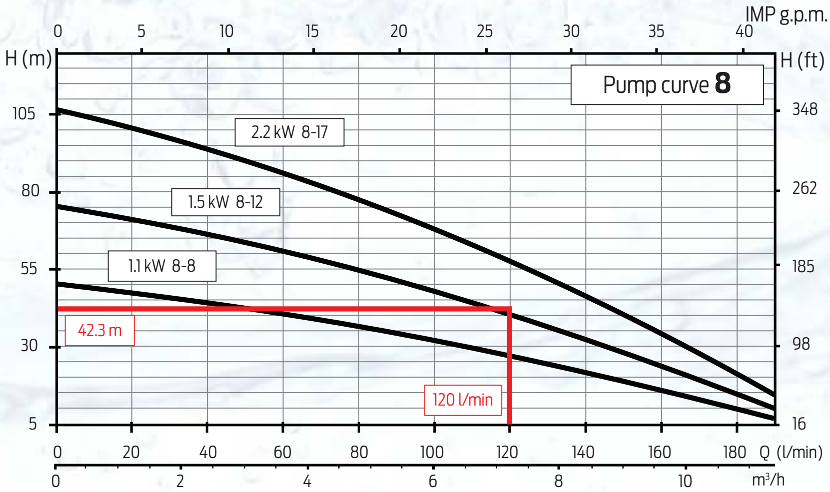


fig. 4

-A: the maximum difference between the water surface and the ground with pump in action is 9 m
-B: the height from the ground to the highest point of use is 5 m
-C: a working pressure of 25 m of water column (2,5 bar) is required at the highest point and the head losses, as from fig. 2, appear to be equal to 2,11 m

These losses have been calculated considering that:
- the entire pipeline of 2" in polyethylene is in PE100 and PN16
- the installation depth of the pump is 9m
- the height from the ground to the highest point of use is 5 m
- the length of the horizontal pipe from the well to the building is 40 m

The total length of the pipeline then generates approximately 1,03 m of loss. In addition, the plant has six 90º bends that add an additional 1,08 m of loss.

In our example we calculate **H = A + B + C** where the total height (H) results in 42,3 m (sum of 9+5+25+2,11 + an additional 3% which is 1,23 m given by the prudential factor). To select the pump that will satisfy these hydraulic performances you have to evaluate the curves, depending on the required delivery. In this specific example we need 120 l/min of water and series 8 meets this requirement of delivery at the best efficiency point (fig. 4). Among the pumps from series 8, model 8-12 of 1.5 kW meets the requirement of H = 42,3 m.

PS. The calculation excludes the contribution of pressure due to the dynamic level of the well.