



PUMP HANDBOOK



60 Hz

## **Welcome to Grindex Pump handbook!**

With this handbook we want to share some of our wide experience in pumping with submersible pumps. You will find an overview of all Grindex pumps with technical details and a pump school, intended to help pump users with common matters in pumping with submersible pumps. The handbook also contains more sophisticated technical information, like pH tables and graphs that show friction losses in pipes and hoses.

We are sure you will find this handbook useful. This handbook is also available for download from our website, [www.grindex.com/us](http://www.grindex.com/us). If you need more copies, please contact Grindex.

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# Dewatering pumps

**Grindex dewatering pumps are designed for professional use in tough applications like mines, construction sites, tunnel sites and other demanding industries.**

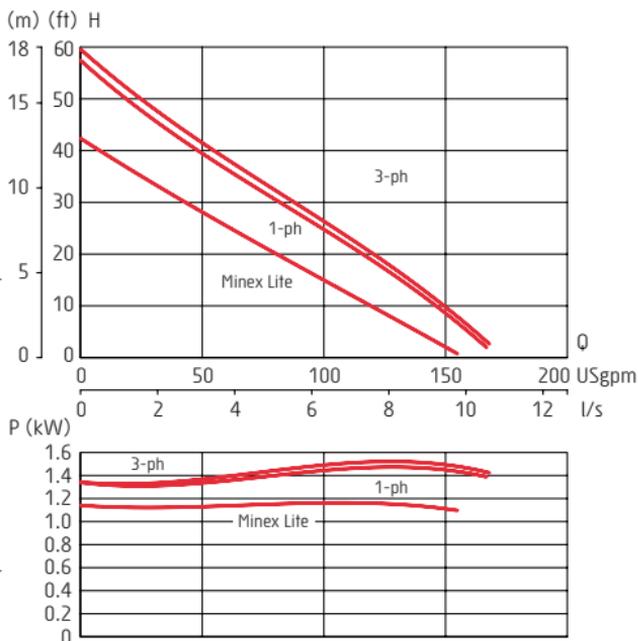
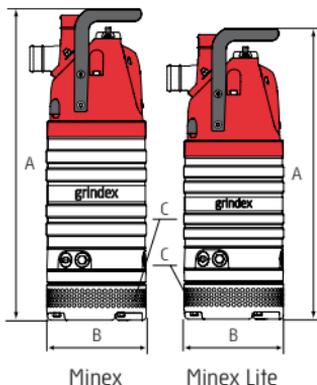
They are designed for:

- Pumping water that may contain solids – up to the size of the strainer holes
- Pumping water with abrasive solids
- Pumping ground water
- Pumping raw water
- Pumping spillage water

Grindex dewatering pumps are designed for continuous, unattended operation. They have proven their reliability and dependable performance in demanding areas like building and construction, mining, tunneling, quarries, general industries and rental applications.



## MINEX



### Technical data

Discharge connection

Minex Lite

2"

1-ph (1.3kW/1.7HP)

2"

3-ph

2"

Rated output

0.97 kW(1.3 HP)

1.3 kW(1.7 HP)

1.4 kW(1.9 HP)

Max power consumption

1.3 kW

1.6 kW

1.8 kW

Shaft speed

3400 RPM

3460 RPM

3330 RPM

Rated current at 115V

11 A

-

-

Rated current at 230 V

5.6 A

7.4 A

5.2 A

Rated current at 460 V

-

-

2.6 A

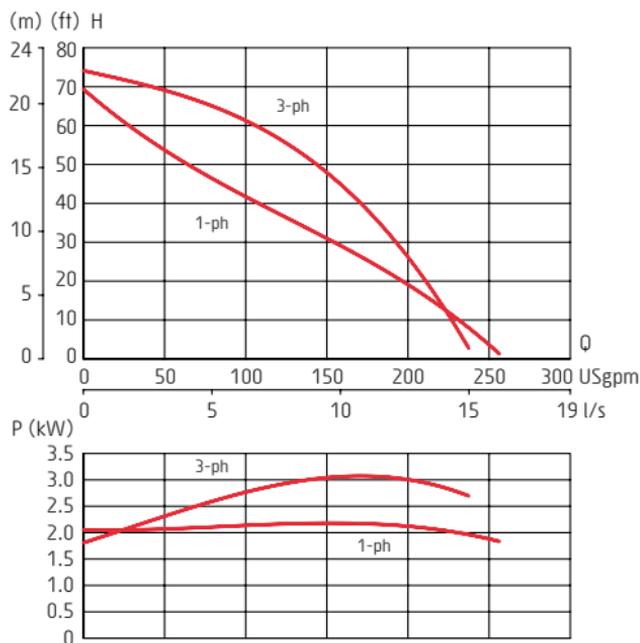
**1-ph (1.3kW/1.7HP): A:** 610 mm (24") **B:**  $\varnothing$  195 mm (7 $\frac{3}{4}$ ") **C:**  $\varnothing$  7.5 mm (0.3")

**Weight:** 24 kg (54 lbs)

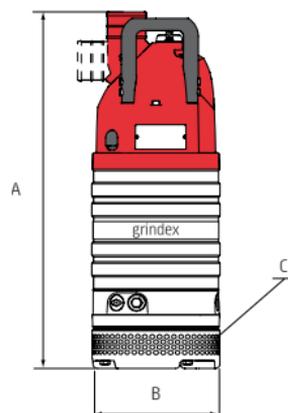
**Minex Lite (1-ph 1.3 kW/1.7 HP) and 3-ph:** A: 570 mm (22.4") **B:**  $\varnothing$  195 mm (7 $\frac{3}{4}$ ")

**C:**  $\varnothing$  7.5 mm (0.3") **Weight:** 21 kg (47 lbs)

Specifications can be changed without notice.



## MINETTE



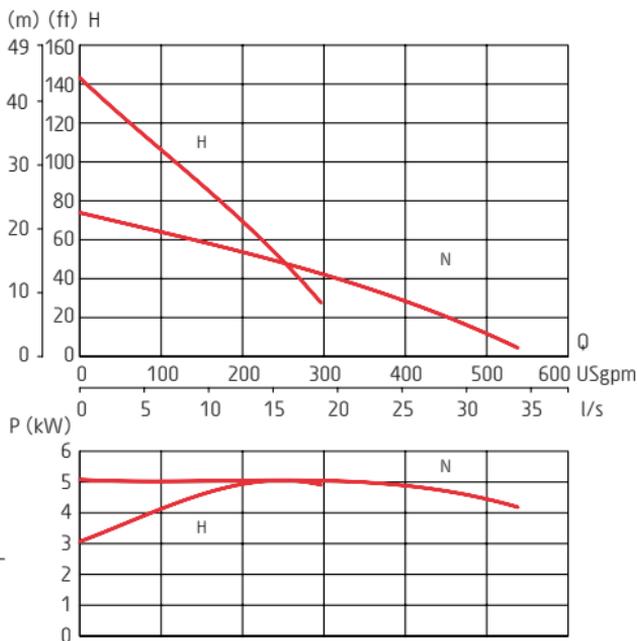
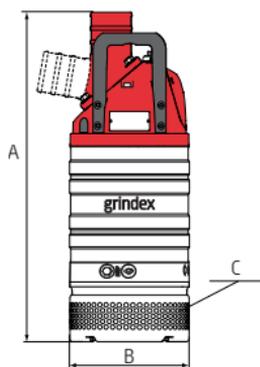
### Technical data

	1-ph	3-ph
Discharge connection	3"	3"
Rated output	1.8 kW (2.4 HP)	2.6 kW (3.5 HP)
Max power consumption	2.2 kW	3.1 kW
Shaft speed	3420 RPM	3410 RPM
Rated current at 230 V	9.9 A	9.5 A
Rated current at 460 V	-	4.7 A

**A:** 667 mm (26¼") **B:** Ø 240 mm (9½") **C:** Ø 9 mm (0.35")

**Weight:** 30 kg (67 lbs) (1-ph), 32 kg (71 lbs) (3-ph)

## MINOR



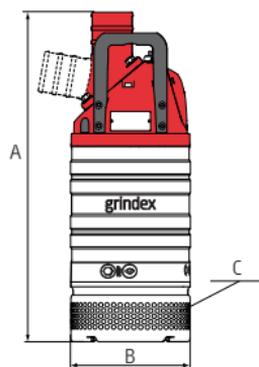
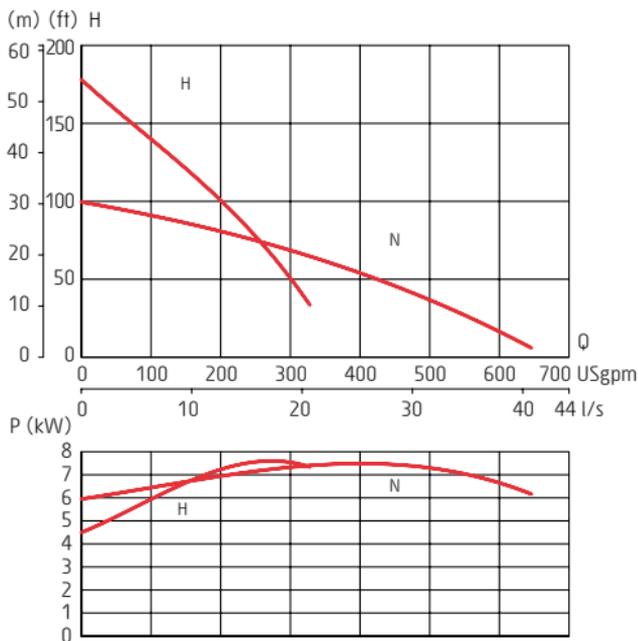
### Technical data

Technical data	N	H
Discharge connection	4"	3"
Rated output	4.4 kW (6.0 HP)	4.4 kW (6.0 HP)
Max power consumption	5.2 kW	5.2 kW
Shaft speed	3500 RPM	3500 RPM
Rated current at 460 V	7.3 A	7.3 A
Rated current at 575 V	5.8 A	5.8 A

**A:** 793 mm (31.2") **B:**  $\varnothing$  286 mm (11.3") **C:**  $\varnothing$  10 mm (0.4")

**Weight:** 52 kg (115 lbs)

## MAJOR



## Technical data

## N

## H

Discharge connection

4"

3"

Rated output

6.6 kW (8.9 HP)

6.6 kW (8.9 HP)

Max power consumption

7.7 kW

7.7 kW

Shaft speed

3500 RPM

3500 RPM

Rated current at 460 V

11 A

11 A

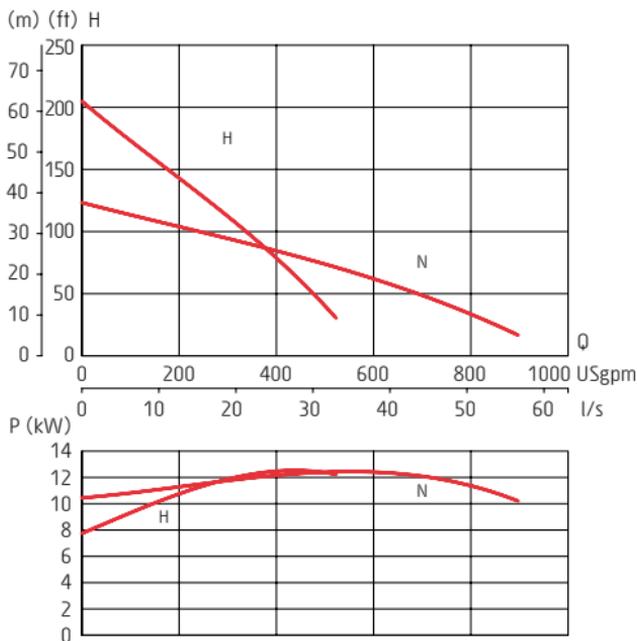
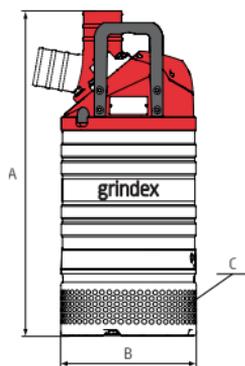
Rated current at 575 V

8.5 A

8.5 A

**A:** 793 mm (31.2") **B:**  $\varnothing$  286 mm (11.3") **C:**  $\varnothing$  10 mm (0.4")**Weight:** 54 kg (119 lbs)

## MASTER



### Technical data

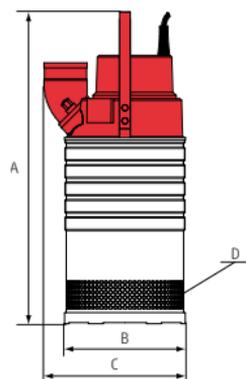
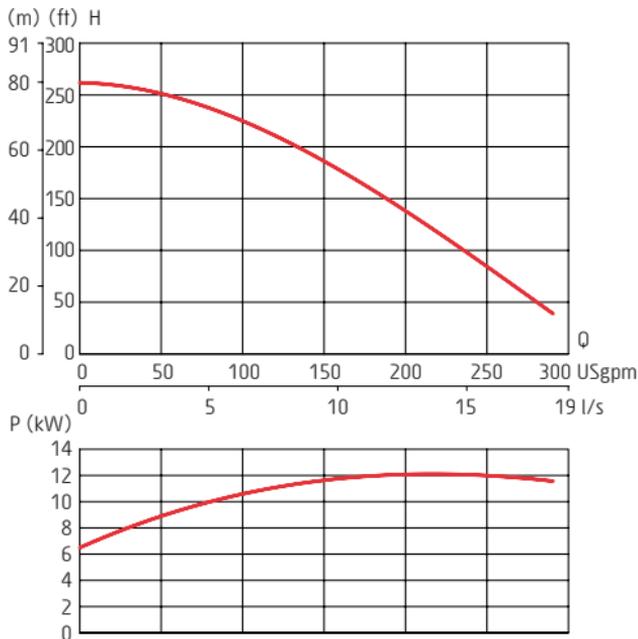
	N	H
Discharge connection	6"	4"
Rated output	11 kW (15 HP)	11 kW (15 HP)
Max power consumption	13 kW	13 kW
Shaft speed	3465 RPM	3465 RPM
Rated current at 460 V	18 A	18 A
Rated current at 575 V	14 A	14 A

**A:** 832 mm (32.8") **B:**  $\varnothing$  346 mm (13.6") **C:**  $\varnothing$  12 mm (0.47")

**Weight:** 80 kg (176 lbs)

Specifications can be changed without notice.

# MASTER SH

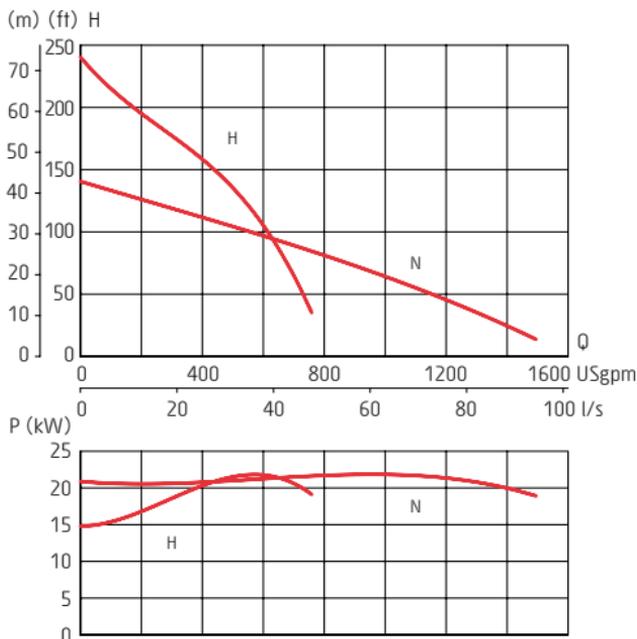
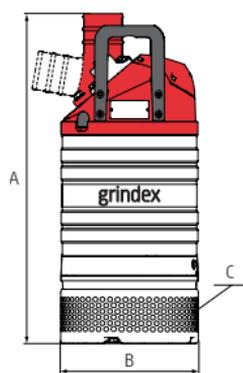


## Technical data

Discharge connection	3"
Rated output	10.5 kW (14.1 HP)
Max power consumption	12 kW
Shaft speed	3440 RPM
Rated current at 460 V	16 A
Rated current at 575 V	13 A

**A:** 720 mm (28.3") **B:**  $\varnothing$  286 mm (11") **C:** 330 mm (13") **D:**  $\varnothing$  8.5 mm (0.33")  
**Weight:** 60 kg (132 lbs)

# MATADOR



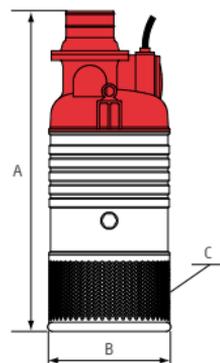
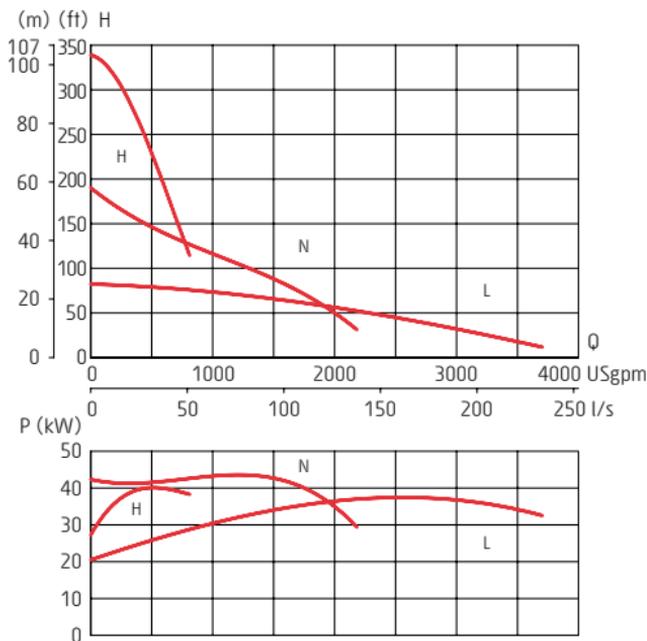
## Technical data

Technical data	N	H
Discharge connection	6"	4"
Rated output	20 kW (27 HP)	20 kW (27 HP)
Max power consumption	22 kW	22 kW
Shaft speed	3500 RPM	3500 RPM
Rated current at 460 V	31 A	31 A
Rated current at 575 V	25 A	25 A

**A:** 954 mm (37.6") **B:**  $\varnothing$  395 mm (15.5") **C:**  $\varnothing$  12 mm (0.47")

**Weight:** 143 kg (315 lbs)

## MAXI

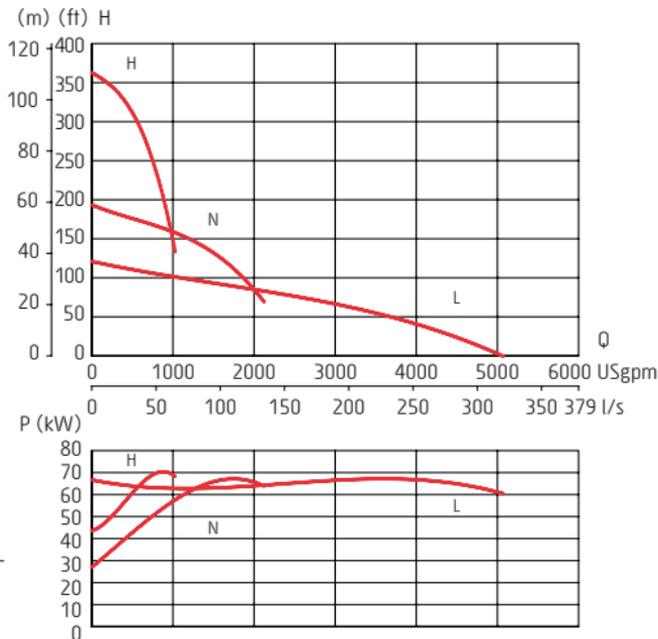
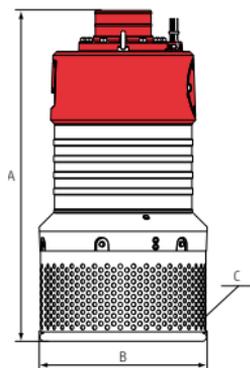


Technical data	N	H	L
Discharge connection	8"	4"	8"
Rated output	43 kW (58 HP)	43 kW (58 HP)	37 kW (50 HP)
Max power consumption	48 kW	48 kW	42 kW
Shaft speed	3545 RPM	3545 RPM	1765 RPM
Rated current at 460 V	65 A	65 A	64 A
Rated current at 575 V	52 A	52 A	48 A

**A:** 1345 mm (50") **B:**  $\varnothing$  510 mm (20") **C:**  $\varnothing$  12 mm (0.47")

**Weight:** 285 kg (633 lbs)

## MAGNUM



### Technical data

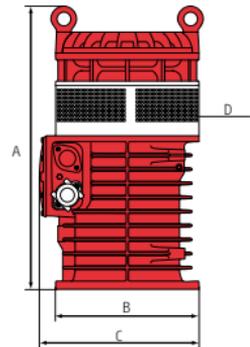
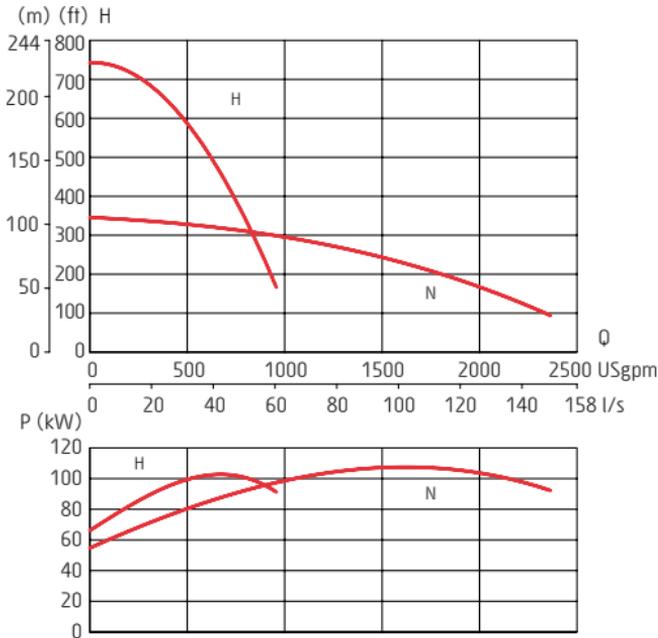
	N	H	L
Discharge connection	8"	6"	10"
Rated output	67 kW (85 HP)	67 kW (85 HP)	67 kW (85 HP)
Max power consumption	73 kW	75 kW	73 kW
Shaft speed	1770 RPM	3540 RPM	1770 RPM
Rated current at 460 V	107 A	100 A	107 A
Rated current at 575 V	85 A	81 A	85 A

**A:** 1475 mm (59") **B:**  $\varnothing$  750 mm (30") **C:**  $\varnothing$  12 mm (0.48")

**Weight:** 540 kg (1190 lbs)

*Specifications can be changed without notice.*

## MEGA



## Technical data

N

H

Discharge connection

6"

4"

Rated output

104 kW (140 HP)

104 kW (140 HP)

Max power consumption

110 kW

110 kW

Shaft speed per min

3560 RPM

3560 RPM

Rated current at 460 V

148 A

148 A

Rated current at 575 V

117 A

117 A

**A:** 1245 mm (49") **B:** 610 mm (24") **C:** 680 mm (26.8") **D:** 10x10 mm (3/8" x 3/8")

**Weight:** N: 900 kg (1984 lbs) H: 985 kg (2167 lbs)

# Materials in drainage pumps

	Minex	Minette	Minor	Major	Master	Master SH	Matador	Maxi	Magnum	Mega
<b>Material</b>										
<b>Upper seal</b>										
Tungsten carbide - tungsten carbide	•	•	•	•	•		•	•	•	•
Carbon - silicon carbide						•				
<b>Lower seal</b>										
Tungsten carbide - tungsten carbide	•	•	•	•	•		•	•	•	•
Silicon carbide - silicon carbide						•				
<b>Stator housing</b>										
Aluminium	•	•	•	•	•	•		•	•	
Cast iron							•			•
<b>Outer casing</b>										
Stainless steel	•	•	•	•	•	•	•	•	•	•
<b>Motor shaft</b>										
Stainless steel	•	•	•	•	•	•	•	•	•	•
<b>Impeller</b>										
High chrome alloyed white cast iron	•	•	•	•	•	•	•	•	•	•
<b>Suction cover</b>										
High chrome cast iron		3-ph	•	•	•		•			
<b>Lower diffusor</b>										
Nitrile rubber	•	1-ph				•		•		•
Polyurethane								•	•	
<b>Upper diffusor</b>										
Nitrile rubber	•		•	•	•	•	•	•	•	
Polyurethane								•		
<b>Screws and nuts</b>										
Stainless steel	•	•	•	•	•	•	•	•	•	•
<b>O-rings</b>										
Nitrile rubber	•	•	•	•	•	•	•	•	•	•
<b>Casted parts</b>										
Aluminium	•	•	•	•	•	•	•	•	•	
Cast iron										•

## Sludge pumps

**Grindex sludge pumps are designed for professional use in tough applications like mines, construction sites, tunnel sites and other demanding industries.**

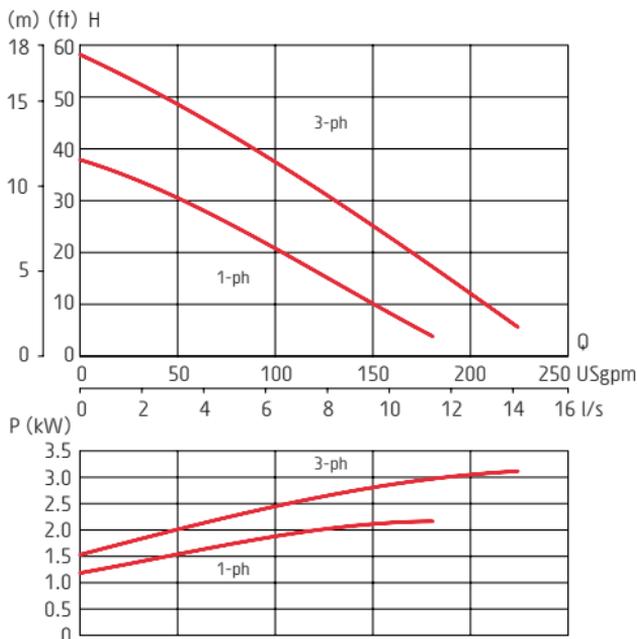
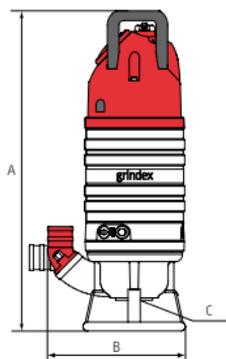
They are designed for:

- Pumping water with solids handling capacity, up to the size of 3.2" (80 mm).
- Pumping water which contains abrasive particles
- Pumping different types of mud and sludge
- Pumping light slurry

The pumps are designed for continuous, unattended operation. They have proven their reliability and dependable performance in demanding areas like building and construction, mining, tunneling, quarries, general industries, car washes and rental applications.



# SALVADOR



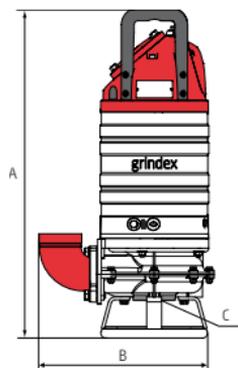
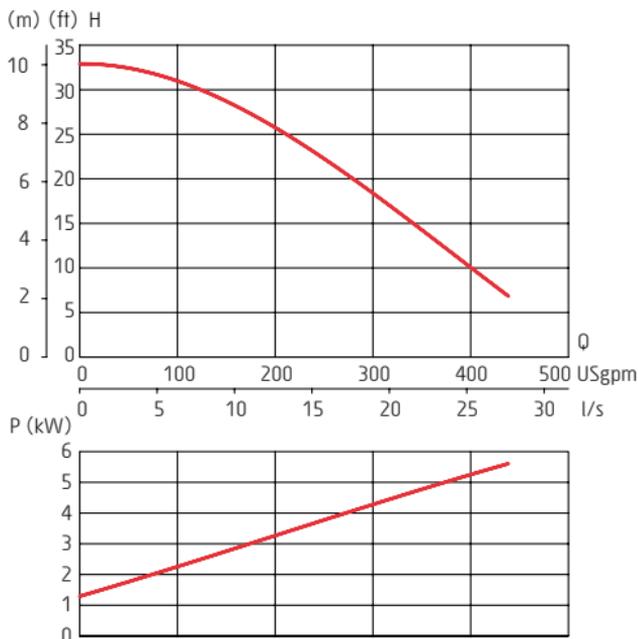
## Technical data

	1-ph	3-ph
Discharge connection	3"	3"
Rated output	1.8 kW (2.4 HP)	2.6 kW (3.5 HP)
Max power consumption	2.2 kW	3.1 kW
Shaft speed	3420 RPM	3420 RPM
Rated current at 230 V	9.9 A	9.5 A
Rated current at 460 V	-	4.7 A

**A:** 766 mm (30.1") **B:**  $\varnothing$  375 mm (14.8") **C:**  $\varnothing$  50 mm (2")

**Weight:** 34 kg (75 lbs)

## SENIOR



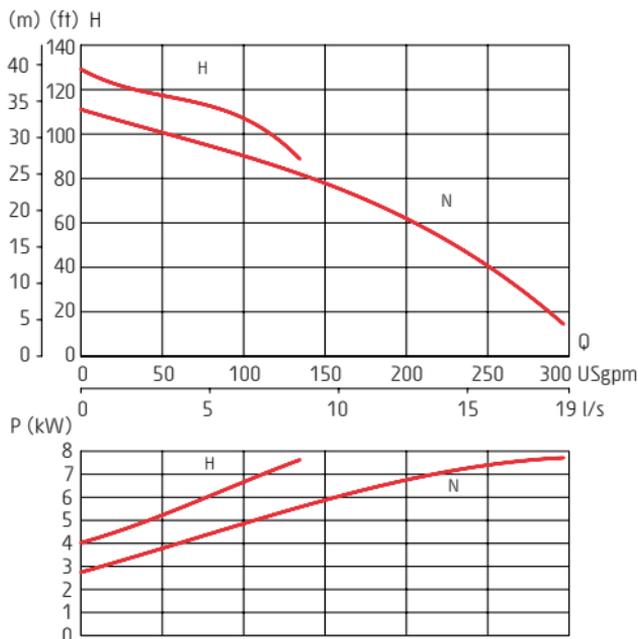
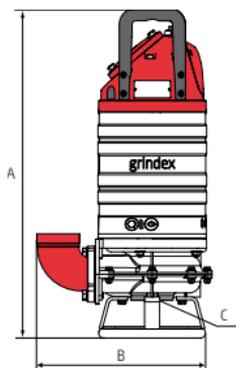
### Technical data

Discharge connection	4"
Rated output	4.5 kW (6.0 HP)
Max power consumption	5.7 kW
Shaft speed	1700 RPM
Rated current at 460 V	8.6 A
Rated current at 575 V	6.9 A

**A:** 879 mm (34.1") **B:**  $\varnothing$  480 mm (18.9") **C:**  $\varnothing$  80 mm (3.2")

**Weight:** 57 kg (126 lbs)

## SANDY



### Technical data

	N	H
Discharge connection	3"	3"
Rated output	6.6 kW (8.9 HP)	6.6 kW (8.9 HP)
Max power consumption	7.7 kW	7.7 kW
Shaft speed	3500 RPM	3500 RPM
Rated current at 460 V	11 A	11 A
Rated current at 575 V	8.5A	8.5 A

**A:** 879 mm (34.1") **B:**  $\varnothing$  480 mm (18.9") **C:**  $\varnothing$  46 mm / 1.8" (N)  $\varnothing$  32 mm / 1.3" (H)  
**Weight:** 57 kg (126 lbs)

## Materials in sludge pumps

	Salvador	Senior	Sandy
<b>Material</b>			
<b>Upper seal:</b>			
Tungsten carbide - tungsten carbide	•	•	•
<b>Lower seal</b>			
Tungsten carbide - tungsten carbide	•	•	•
<b>Stator housing</b>			
Aluminium	•	•	•
<b>Outer casing</b>			
Stainless steel	•	•	•
<b>Motor shaft</b>			
Stainless steel	•	•	•
<b>Impeller</b>			
High chrome alloyed white cast iron	•	•	•
<b>Pump housing</b>			
Polyurethane	•	•	•
<b>Screws and nuts</b>			
Stainless steel	•	•	•
<b>O-rings</b>			
Nitrile rubber	•	•	•
<b>Casted parts</b>			
Aluminium	•	•	•

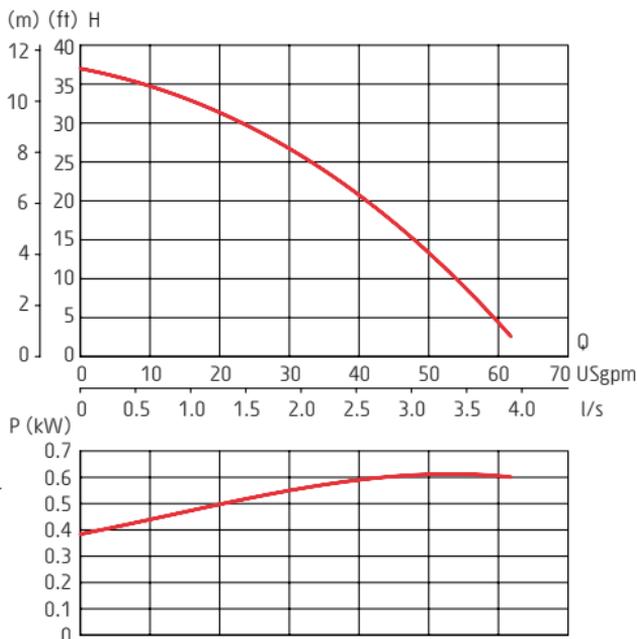
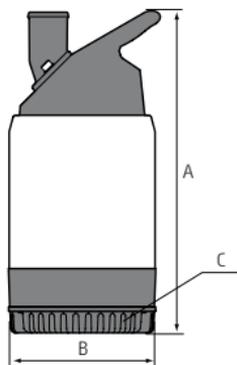
### Small dewatering and sludge pumps

These small dewatering and sludge pumps are small, easy to carry, yet still intended for professional use. They are frequently used in construction and rental applications, flood relief in basements and other applications that require lightweight pumps. The sludge pump Solid has set a new standard for lightweight sludge pumps and is appreciated all over the world. It can pump solids in suspension up to the size of 1.5" (38 mm).





## MICRO



### Technical data

1-ph

Discharge connection

2"

Rated output

0.45 kW (0.6 HP)

Max power consumption

0.65 kW

Shaft speed

3300 RPM

Rated current at 115V

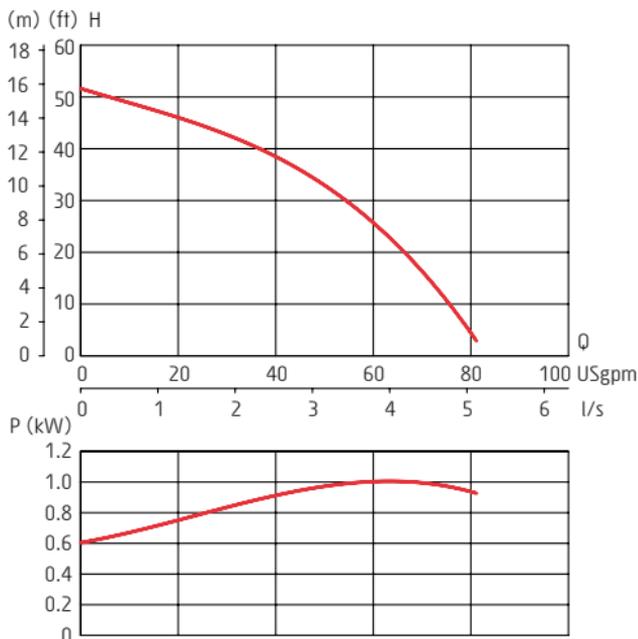
5.5 A

Rated current at 230 V

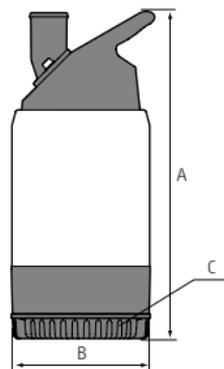
2.9 A

**A:** 400 mm (15.7") **B:**  $\varnothing$  185 mm (7.3") **C:** 5x11 mm (0.2x0.4")

**Weight:** 10 kg (22 lbs)



## MACRO



### Technical data

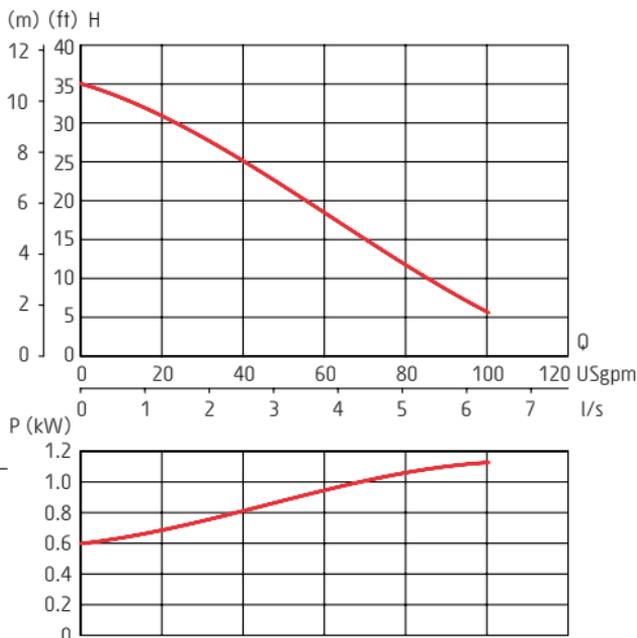
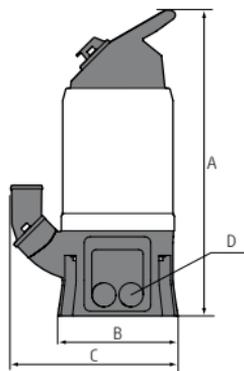
### 1-ph

Discharge connection	2"
Rated output	0.82 kW (1.1 HP)
Max power consumption	1.1 kW
Shaft speed	3400 RPM
Rated current at 115V	9.8 A
Rated current at 230 V	4.8 A

**A:** 430 mm (17.0") **B:**  $\varnothing$  185 mm (7.3") **C:** 5x11 mm (0.2x0.4")

**Weight:** 12.5 kg (28 lbs)

## SOLID



### Technical data

### 1-ph

Discharge connection	2"
Rated output	0.82 kW (1.1 HP)
Max power consumption	1.1 kW
Shaft speed	3400 RPM
Rated current at 115V	9.8 A
Rated current at 230 V	4.8 A

**A:** 510 mm (20") **B:**  $\varnothing$  200 mm (8") **C:** 280 mm (11") **D:**  $\varnothing$  38 mm (1.5")  
**Weight:** 15 kg (33 lbs)

## Materials in small dewatering and sludge pumps

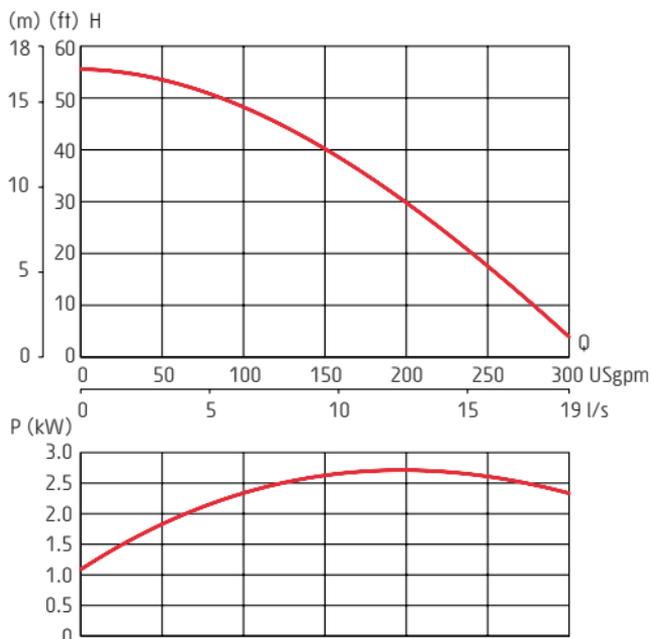
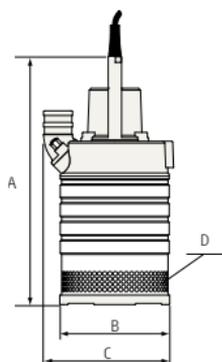
	Micro	Macro	Solid
<b>Material</b>			
<b>Pump top</b>			
Stainless steel/ reinforced polymer	•	•	•
<b>Diffuser (drainage)</b>			
Polyurethane wear parts	•	•	
<b>Pump housing (sludge)</b>			
Polyurethane wear parts			•
<b>Outer casing</b>			
Stainless steel	•	•	•
<b>Stator housing</b>			
Stainless steel	•	•	•
<b>Motor shaft</b>			
Stainless steel	•	•	•
<b>Upper seal</b>			
Carbon/aluminium oxide	•	•	•
<b>Lower seal</b>			
Silicon carbide/Silicon carbide	•	•	•
<b>Impeller</b>			
Polyurethane	•	•	•
<b>Screws and nuts</b>			
Stainless steel	•	•	•

### Dewatering pumps made of stainless steel, INOX

These pumps are designed to meet the tough requirements from mines, construction sites, landfill sites and other applications that deal with corrosive water. One application is in mines where the water becomes caustic and destroys conventional pumps in a matter of days. The pumps may also be used in applications where saltwater is pumped, like ship-yards, fish farms, construction works in harbors and offshore projects. All INOX pumps can be equipped with zinc anodes for extra protection.



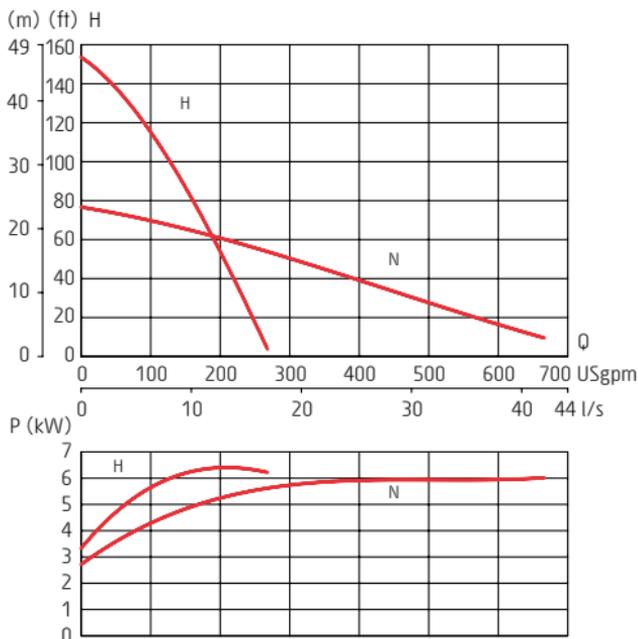
## MINETTE INOX



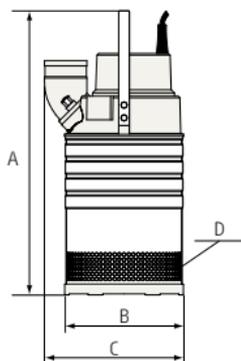
### Technical data

Discharge connection	3"
Rated output	2.3 kW (3.1 HP)
Max power consumption	2.9 kW
Shaft speed	3320 RPM
Rated current at 460V	4.2 A
Rated current at 575V	3.3 A

**A:** 535 mm (21") **B:** Ø 240 mm (9.5") **C:** 295 mm (11") **D:** Ø 7.5 mm (0.3")  
**Weight:** 44 kg (90 lbs)



## MAJOR INOX

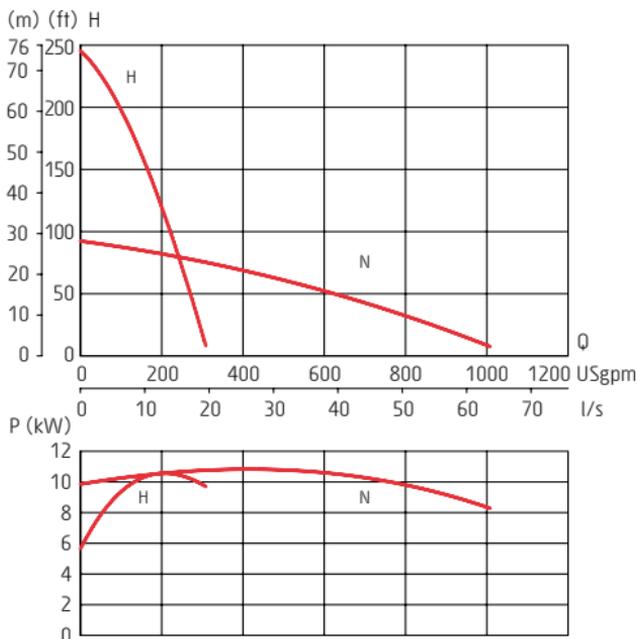
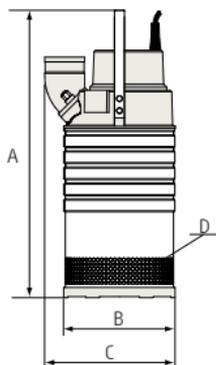


### Technical data

Technical data	N	H
Discharge connection	4"	3"
Rated output	6.7 kW (9.0 HP)	6.7 kW (9.0 HP)
Max power consumption	7.6 kW	7.6 kW
Shaft speed	3460 RPM	3460 RPM
Rated current at 460 V	11 A	11 A
Rated current at 575 V	8.6 A	8.6 A

**A:** 665 mm (26") **B:**  $\varnothing$  280 mm (11") **C:** 330 mm (13") **D:**  $\varnothing$  8.5 mm (0.3")  
**Weight:** 65 kg (143 lbs)

## MASTER INOX



### Technical data

Technical data	N	H
Discharge connection	4"	3"
Rated output	9.7 kW (13 HP)	9.7 kW (13 HP)
Max power consumption	11 kW	11 kW
Shaft speed	3460 RPM	3460 RPM
Rated current at 460 V	15 A	15 A
Rated current at 575 V	12 A	12 A

**A:** 720 mm (28") **B:**  $\varnothing$  280 mm (11") **C:** 330 mm (13") **D:**  $\varnothing$  8.5 mm (0.3")  
**Weight:** 77 kg / 170 lbs (N), 81 kg / 179 lbs (H)

## Materials in drainage pumps made of stainless steel

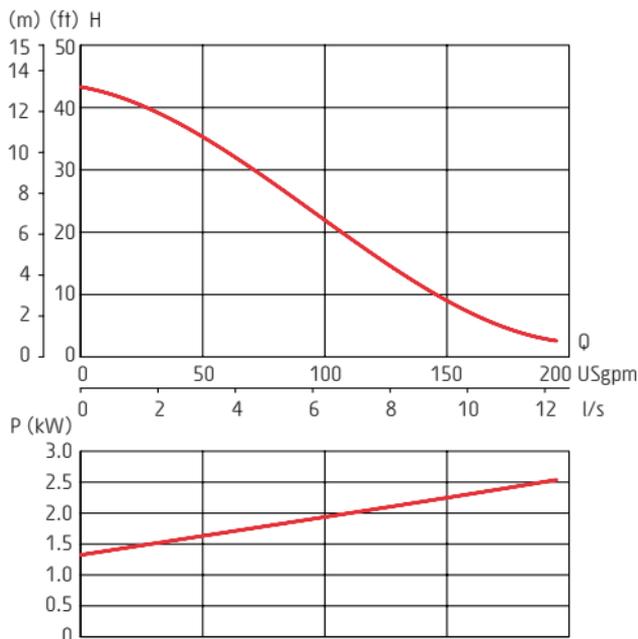
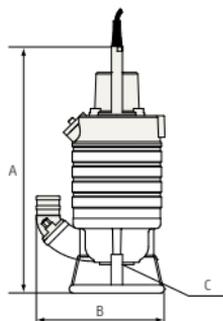
	Minette INOX	Major INOX	Master INOX
<b>Material</b>			
<b>Upper seal</b>			
Carbon - silicon carbide	•	•	•
<b>Lower seal</b>			
Silicon carbide - silicon carbide	•	•	•
<b>Casted parts</b>			
Stainless steel (EN 10283-1.14412)	•	•	•
<b>Outer casing</b>			
Stainless steel (EN 10088-3-1.14436)	•	•	•
<b>Motor shaft</b>			
Stainless steel (EN 10088-3-1.14460)	•	•	•
<b>Impeller</b>			
Stainless steel (EN 10283-1.14412)	•	•	•
<b>Screws and nuts</b>			
Stainless steel (A4)	•	•	•
<b>O-rings</b>			
Viton rubber	•	•	•
<b>Diffusers</b>			
Nitrile rubber	•	•	•

### Sludge pumps made of stainless steel, INOX

Our sludge pumps in stainless steel are used for pumping corrosive fluids with solids in harsh environments. The solids can be up to the size of 3.1" (50 mm). These pumps are designed to meet the tough requirements from mines, construction sites, landfill sites and other applications that deal with corrosive water. One application is in mines where the water becomes caustic and destroys conventional pumps in a matter of days. The pumps may also be used in applications where saltwater is pumped, like shipyards, fish farms, construction works in harbors and offshore projects. All INOX pumps can be equipped with zinc anodes for extra protection.



## SALVADOR INOX



### Technical data

Rated output 2.3 kW (3.1 HP)

Max power consumption 2.9 kW

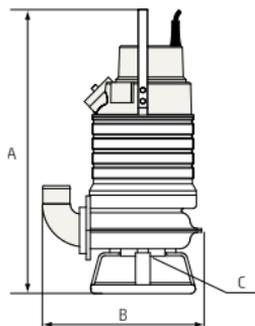
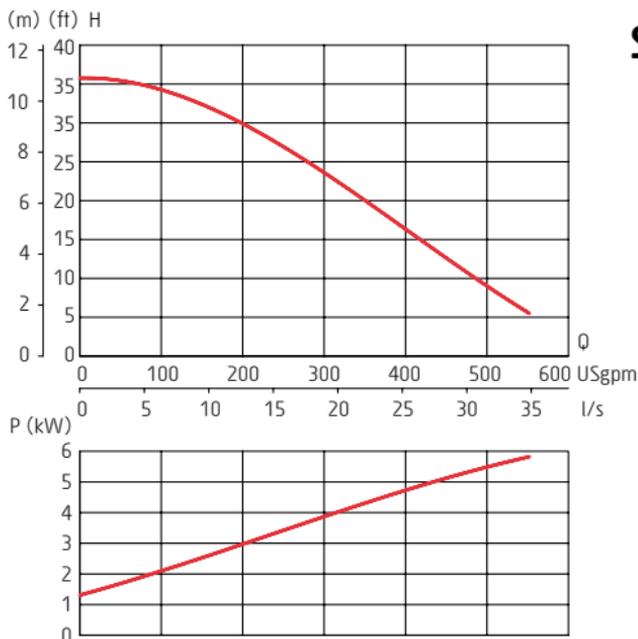
Shaft speed 3320 RPM

Rated current at 460V 4.2 A

Rated current at 575V 3.4 A

**A:** 645 mm (21") **B:** 375 mm (9.5") **C:** Ø 50 mm (2") **Weight:** 48 kg (72 lbs)

## SENIOR INOX



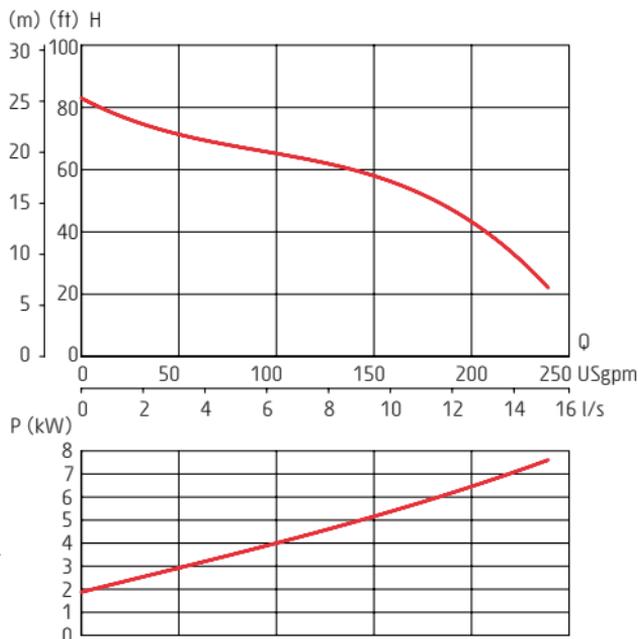
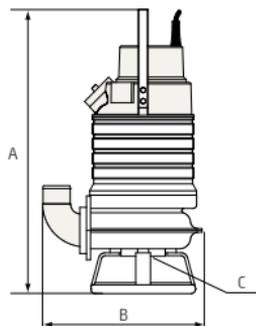
### Technical data

Discharge connection	4"
Rated output	5.1 kW (6.6 HP)
Max power consumption	6.2 kW
Shaft speed	1670 RPM
Rated current at 460V	9 A
Rated current at 575V	7.3 A

**A:** 775 mm (30") **B:** 480 mm (19") **C:** Ø 80 mm (3.1")

**Weight:** 86 kg (191 lbs)

## SANDY INOX



### Technical data

Discharge connection	3"
Rated output	6.7 kW (9.0 HP)
Max power consumption	7.6 kW
Shaft speed	3455 RPM
Rated current at 460 V	11 A
Rated current at 575 V	8.6 A

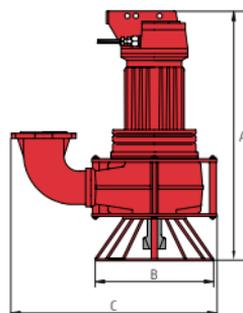
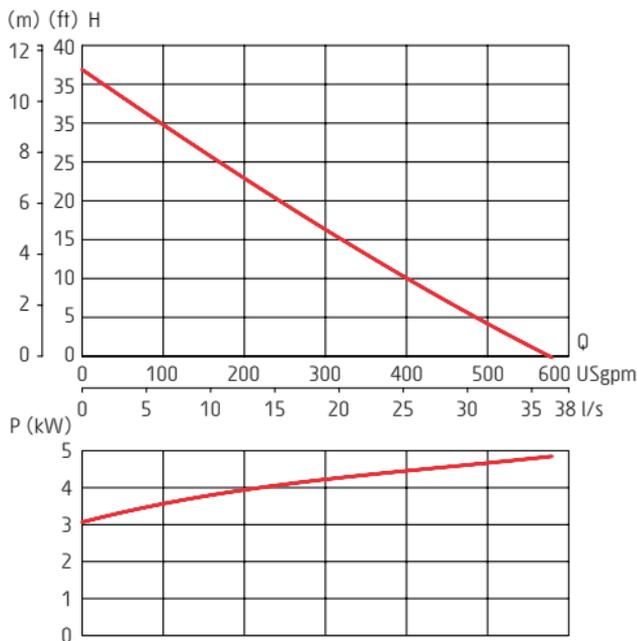
**A:** 775 mm (30") **B:** 480 mm (19") **C:** Ø 46 mm **Weight:** 86 kg (191 lbs)

## Materials in sludge pumps made of stainless steel

	Salvador INOX	Senior INOX	Sandy INOX
<b>Material</b>			
<b>Upper seal</b>			
Carbon - silicon carbide	•	•	•
<b>Lower seal</b>			
Silicon carbide - silicon carbide	•	•	•
<b>Casted parts</b>			
Stainless steel (EN 10283-1.14412)	•	•	•
<b>Outer casing</b>			
Stainless steel (EN 10088-3-1.14436)	•	•	•
<b>Motor shaft</b>			
Stainless steel (EN 10088-3-1.14460)	•	•	•
<b>Impeller</b>			
Stainless steel (EN 10283-1.14412)	•	•	•
<b>Screws and nuts</b>			
Stainless steel (A4)	•	•	•
<b>O-rings</b>			
Viton rubber	•	•	•
<b>Pump housing</b>			
Nitrile rubber	•	•	•

### Slurry pumps, BRAVO

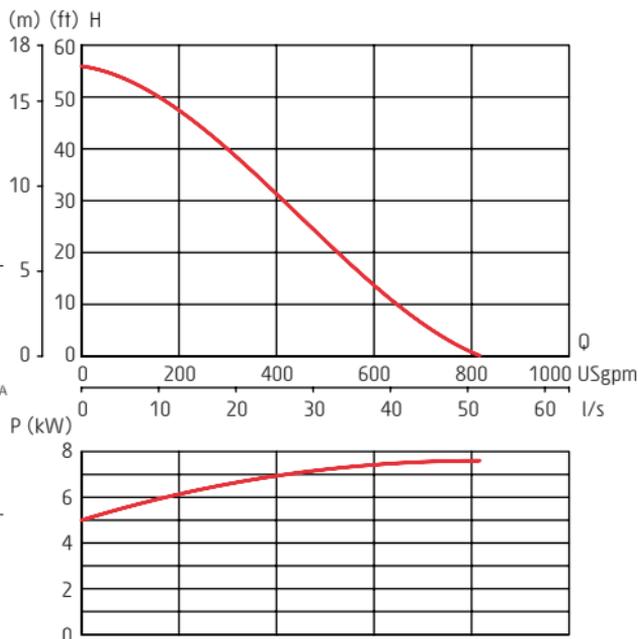
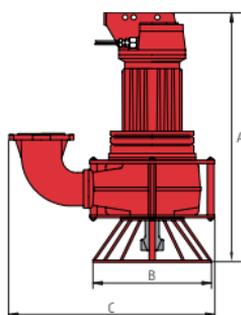
Grindex slurry pumps are designed for use in quarries, mines, dredging, cleaning of settling ponds and other abrasive other industries that require pumps with very high durability. Each part of the BRAVO pump is designed for maximum endurance and reliability – an absolute must when pumping slurry. Wear is reduced by using NiHard 4 for all hydraulic components. NiHard 4 is a nickel alloy and one of the hardest materials available today. All BRAVO pumps can handle liquids with pH values from 4 up to 10.

**BRAVO 20****Technical data**

Discharge connection	4"
Rated output	4.0 kW (5.4 HP)
Max power consumption	5.1 kW
Shaft speed	1750 RPM
Rated current at 460V	8.7 A
Rated current at 575V	7.0 A
Throughlet with/without agitator	30 / 80 mm (1¼" / 3")

**A:** 850 (33½") **B:** Ø 410 (16¼") **C:** 713 (28¼") **Weight:** 162 kg (358 lbs)

## BRAVO 30

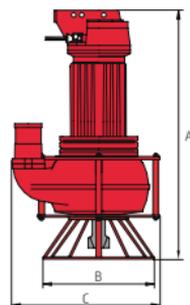
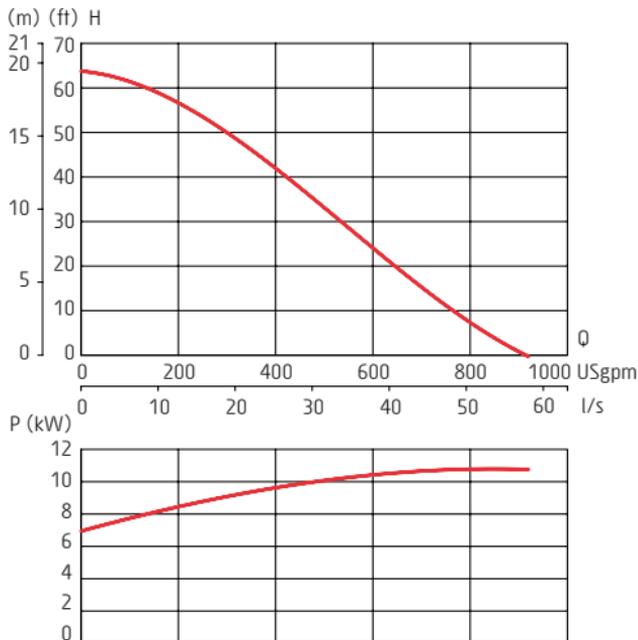


### Technical data

Discharge connection	4"
Rated output	8.6 kW (11.5 HP)
Max power consumption	10.6 kW
Shaft speed	1750 RPM
Rated current at 460 V	15.3 A
Rated current at 575 V	12.3 A
Throughlet with/without agitator	30 / 80 mm (1¼" / 3")

**A:** 850 (33½") **B:** Ø 410 (16¼") **C:** 713 (28¼") **Weight:** 167 mm (371")

## BRAVO 40

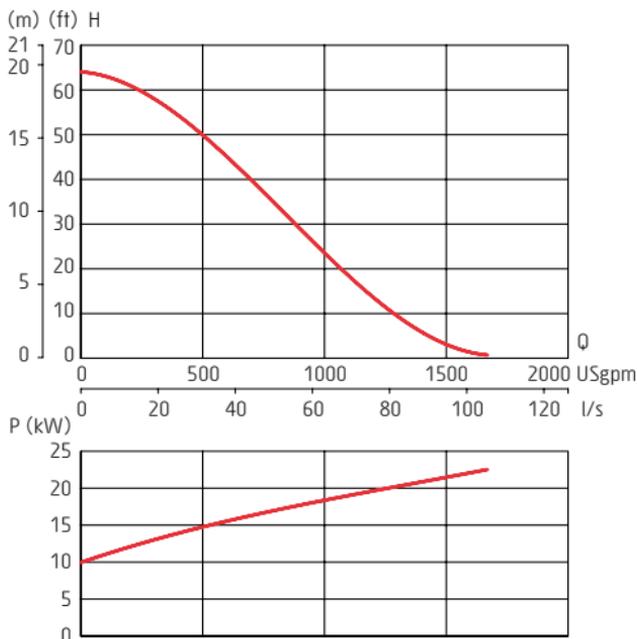
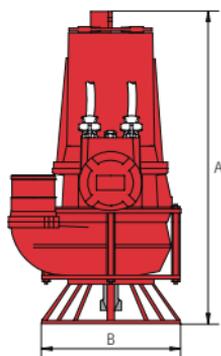


### Technical data

Discharge connection	4"
Rated output	14.9 kW (20 HP)
Max power consumption	17.5 kW
Shaft speed	1750 RPM
Rated current at 460 V	26 A
Rated current at 575 V	21 A
Throughlet with/without agitator	35 / 100 mm (1 1/2" / 4")

**A:** 960 mm (38") **B:**  $\varnothing$  410 mm (16 1/4") **C:** 580 mm (23") **Weight:** 199 kg (422 lbs)

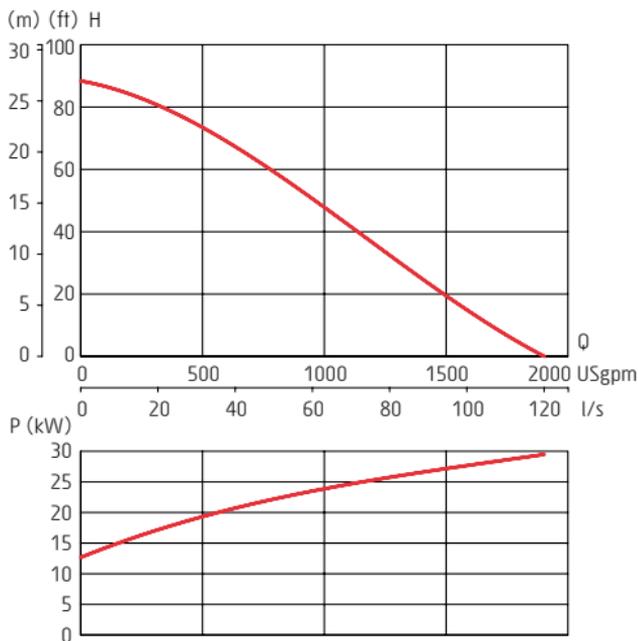
## BRAVO 50



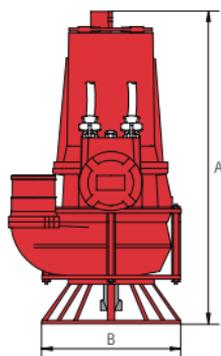
### Technical data

Discharge connection	6"
Rated output	25.0 kW (33.5 HP)
Max power consumption	29.8 kW
Shaft speed	1750 RPM
Rated current at 460 V	46.1 A
Rated current at 575 V	36.9 A
Throughlet with/without agitator	50 / 100 mm (2" / 4")

**A:** 1040 mm (41½") **B:** Ø 470 mm (18½") **Weight:** 344 kg (764 lbs)



## BRAVO 60

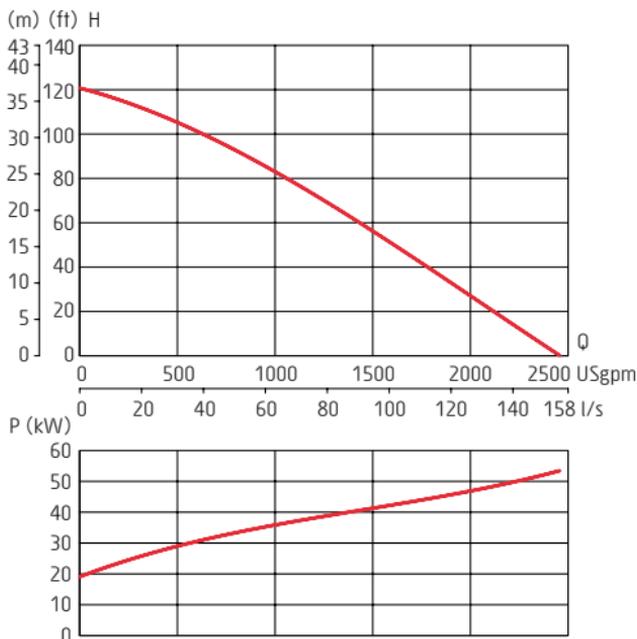
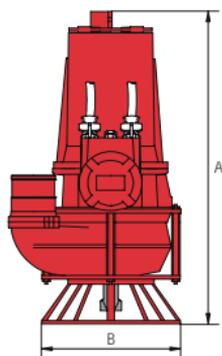


### Technical data

Discharge connection	6"
Rated output	39 kW (52.3 HP)
Max power consumption	45.4 kW
Shaft speed	1750 RPM
Rated current at 460 V	66.2 A
Rated current at 575 V	52.9 A
Throughlet with/without agitator	50 / 100 mm (2" / 4")

**A:** 1100 mm (43½") **B:** Ø 470 mm (18½") **Weight:** 407 kg (904 lbs)

## BRAVO 70



### Technical data

Discharge connection	6"
Rated output	55 kW (73.7 HP)
Max power consumption	62.5 kW
Shaft speed	1750 RPM
Rated current at 460 V	86.1 A
Rated current at 575 V	68.9 A
Throughlet with/without agitator	50/100 mm (2" / 4")

**A:** 1175 mm (46½") **B:** Ø 470 mm (18½") **Weight:** 475 kg (1055 lbs)

## Pumping slurry

Pumping fluids with high solids concentrations is a bit more complicated than pumping water. To avoid sedimentation in the system, you need to choose the right pump size and dimensions of hoses and pipes. The concentration of solids together with their size and shape may also affect pump performance and power requirements and therefore pump choice. Remember that settled solids might need external agitators, water jets or mixers to get them back in suspension and allow them to be pumped.

As each application requires its own calculation, we recommend you contact your Grindex dealer.



## Materials in slurry pumps

	Bravo 20	Bravo 30	Bravo 40	Bravo 50	Bravo 60	Bravo 70
<b>Material</b>						
<b>Motor housing</b>						
Cast iron	•	•	•	•	•	•
<b>Seal housing</b>						
NiHard 4	•	•	•	•	•	•
<b>Volute</b>						
NiHard 4	•	•	•	•	•	•
<b>Hose adapter</b>						
NiHard 4	•	•	•	•	•	•
<b>Impeller</b>						
NiHard 4	•	•	•	•	•	•
<b>Agitator</b>						
NiHard 4	•	•	•	•	•	•
<b>Motor shaft</b>						
Stainless steel	•	•	•	•	•	•
<b>Screws and nuts</b>						
Stainless steel	•	•	•	•	•	•

## Accessories

Some applications require the use of additional devices. Here is a list of Grindex accessories and what pumps they can be used with.

- Available
- Not an optimal choice
- x Not available

	Zinc anodes	Low suction collar	Float switch	Tandem connection	Pump raft
<b>Drainage pumps</b>					
Minex	○	○	○	x	○
Minette	○	○	○	x	○
Minor	○	○	○	○	○
Major	○	○	○	○	○
Master	○	x	○	○	○
Master SH	○	x	○	○	○
Matador	○	x	○	○	○
Maxi	○	x	○	○	○
Magnum	○	x	○	○ (H)	○
Mega	○	x	○	x	x

<b>Sludge pumps</b>					
Salvador	○	x	○	x	●
Senior	○	x	○	x	●
Sandy	○	x	○	x	●

	Zinc anodes	Low suction collar	Float switch	Tandem connection	Pump raft
<b>Small drainage and sludge pumps</b>					
Micro	X	○	○	X	○
Macro	X	○	○	X	○
Solid	X	X	○	X	○
<b>Drainage pumps made of stainless steel</b>					
Minette Inox	○	○	●	X	●
Major Inox	○	○	●	X	●
Master Inox	○	○	●	X	●
<b>Sludge pumps made of stainless steel</b>					
Salvador Inox	○	X	●	X	●
Senior Inox	○	X	●	X	●
Sandy Inox	○	X	●	X	●
<b>Slurry pumps</b>					
Bravo 20	X	X	○	X	○
Bravo 30	X	X	○	X	○
Bravo 40	X	X	○	X	○
Bravo 50	X	X	○	X	○
Bravo 60	X	X	○	X	○
Bravo 70	X	X	○	X	○

## Grindex Pump school

The school consists of technical articles, intended to help pump users with common issues in pumping with submersible pumps.

### Part 1: Choosing the right pump type for the job

A dewatering pump is the most commonly used pump type in mines and at construction sites. It is used for pumping water with less abrasive solids, like clay. Sand and solids in suspension can also be pumped, up to the size of the strainer holes (normally 0.3-0.5" / 7-12 mm). As sand is quite abrasive to the pump, it must not be too concentrated.



Sludge pumps are suitable for pumping water with solids, as well as for pumping sludge. The solids can be up to the size of the pump inlet diameter (normally 1.3-3.1" / 32-80 mm).



Pumps made of stainless steel are often used in copper mines, gold mines and other applications with corrosive fluids. An aluminum pump can handle water with pH values from 5-8, while a stainless steel pump can cope with pH values from 2-10.



Slurry pumps are designed to handle abrasive solids in suspension, like sand, gravel and concrete, in high concentration. They are also frequently used to move sand in suspension, i.e. at a dredging operation. To cope with the abrasives, the hydraulic parts of a slurry pump are often made of NiHard 4, a very hard metal alloy. For improved performance, slurry pumps are generally equipped with an agitator.



### Plug and pump

An electrical submersible pump is easy to use, just plug it in and pump. Several small pumps, placed where the need is for the moment, can pump the water to a dedicated collecting pit through long hoses. As the smaller pumps only weights 22-40 lbs (10-25 kg), they are easily moved to different spots throughout the site.

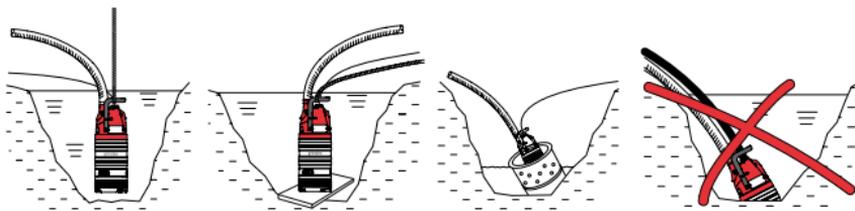


In the collection pit, a bigger pump is installed and pumps the water away from the site. By this method you can easily dewater a large area with just a few pumps.



## Part 2: Pump arrangement

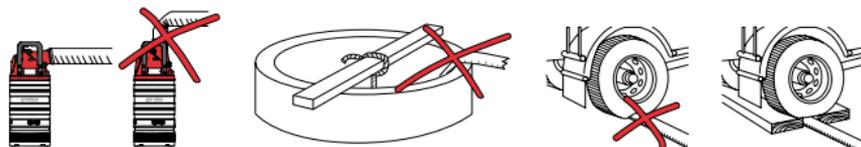
To install an electric submersible pump is easy; place it in the water, connect the hose and turn on the power. Despite the simplicity, there are a few details to consider for optimizing the pump:



Arrange the pump so it doesn't burrow itself into sand or clay. This is a common problem at construction sites. It can be avoided quite simply by placing the pump on a bed of coarse gravel or a plank. The pump can also be hung freely by a rope or chain, or put into a cut-down and perforated oil drum.

### Avoid sharp bend on the hose.

As sharp bends, kinks and pinching of the hose are reducing the capacity of the pump, a lot is won by avoiding those circumstances. Turning the pumps discharge connection so the hose doesn't begin with a kink is easily arranged; it can be fitted vertical or horizontal on almost all Grindex pumps.

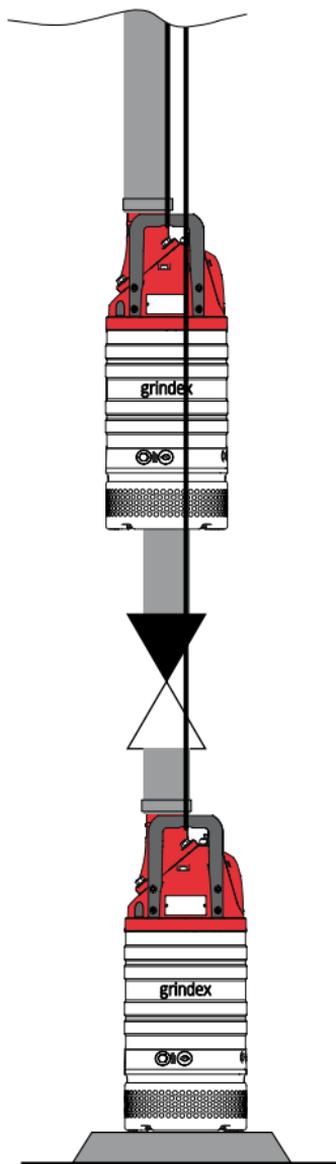


### Tandem connection

In order to achieve higher pumping heads, two or more dewatering pumps can be connected in series. For this purpose, a series connecting flange is available as an accessory. It is important that the hoses are equipped with check valves, to prevent damage from water running back through the pump if a power failure should occur.

### Long distance pumping

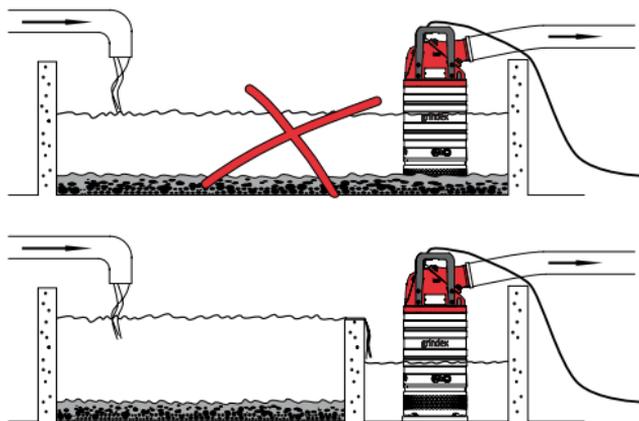
Tandem connection of pumps can also be used when the water needs to be pumped a longer distance. A simple arrangement can be pumping the water to a dedicated collection pit. The pit should be equipped with another pump, passing the water on. This technique can also be used for dewatering a greater area with several pumps spread out, pumping the water to a collection pit. The pit is then equipped with a greater pump, that pumps the water from the site.



### Part 3: Sedimentation

The pumped water is often containing solids that cause wear on pumps, valves and other dewatering equipment. This problem is very common in mines and tunnel construction sites. When pumping water that contains solids (like drill cuttings and sand), there is a risk of sedimentation in the system. A typical symptom is pipes and/or hoses that get filled with sediment, resulting in capacity losses. When the amount of solids increases, there is also an increase of wear on the pump.

One way to prevent this is by using sedimentation tanks where the drill cuttings may settle while the rest of the water is pumped away. The tank needs to be as close to the source as possible, ensuring that the solids are pumped as short distance as possible where the solids can settle. To ensure the efficiency of the sedimentation tank, it needs to have as big of a surface area as possible. The more solids present in the water, the more careful the design of the sedimentation system is necessary.



**For applications where solids can not be avoided, there are recommendations for the velocity of the medium in the discharge line:**

Mixture	Min. velocity in discharge line
1. Water + coarse gravel	13.1ft/s (4 m/s)
2. Water + gravel	11.5 ft/s (3 m/s)
3. Water + sand	
Sand particles < 0.004 in (0.1 mm)	8.2 ft/s (1.5 m/s)
Sand particles < 0.024 in (0.6 mm)	4.9 ft/s (2.5 m/s)



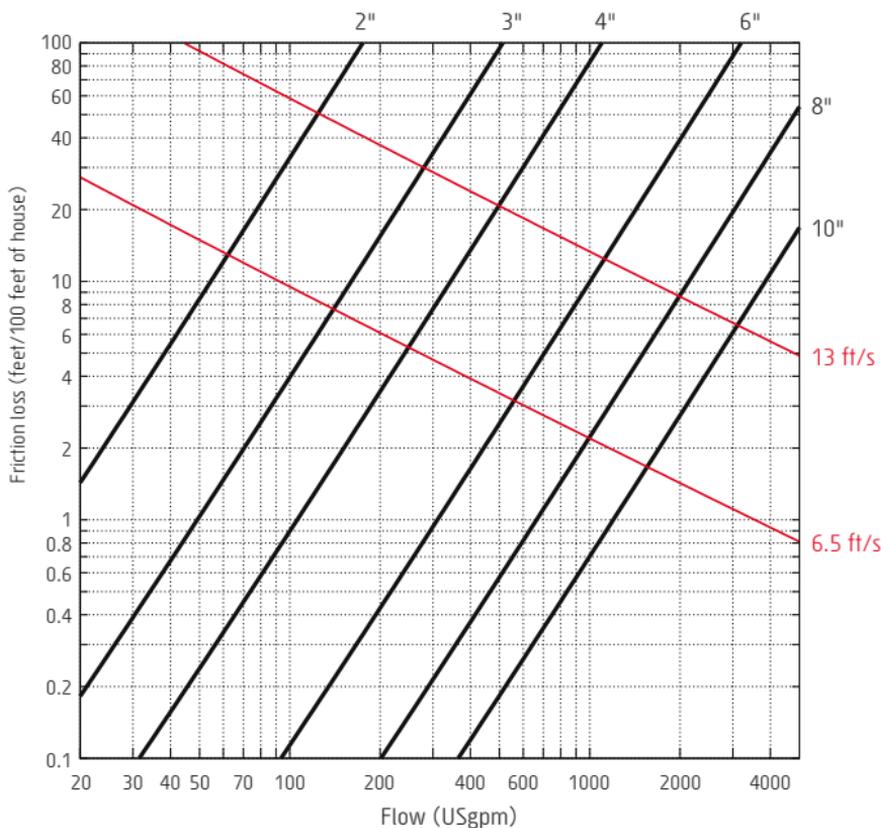
## Limitations for Grindex pumps

Limitations	Drainage pumps	Sludge pumps	Small drainage and sludge pumps
<b>Max. submersion depth (IP68)</b>	20 m (66 ft) (Mega: 75 m (245 ft))	20 m (66 ft)	20 m (66 ft)
<b>Max. liquid temperature</b>	40°C (104°F)	40°C (104°F)	40°C (104°F)
<b>Max. liquid density</b>	1100 kg/m <sup>3</sup> (68 lbs/ft <sup>3</sup> )	1100 kg/m <sup>3</sup> (68 lbs/ft <sup>3</sup> )	1100 kg/m <sup>3</sup> (68 lbs/ft <sup>3</sup> )
<b>pH of the liquid</b>	5-8 (Mega: 6-13)	5-8	3-9

Limitations	Stainless steel pumps	Slurry pumps
<b>Max. submersion depth (IP68)</b>	20 m (66 ft)	20 m (66 ft)
<b>Max. liquid temperature</b>	40°C (104°F)	40°C (104°F)
<b>Max. liquid density</b>	1100 kg/m <sup>3</sup> (68 lbs/ft <sup>3</sup> )	1100 kg/m <sup>3</sup> (68 lbs/ft <sup>3</sup> )
<b>pH of the liquid</b>	2-10	4-10

# Chart for calculating friction losses in hoses

All pump capacities are measured for clean water, directly at the discharge outlet. When connecting a hose you need to consider the friction loss that comes from the size and length of the hose. The chart below shows this.



## Formulas calculating friction losses in hoses and tubes

The chart at 58 was created using the following formulas:

Friction loss (meters)	Velocity (m/s)	Reynolds number	Friction factor (Swamee & Jain formula)
$H_{friction} = \frac{1000 \times f \times L \times v^2}{2 \times g \times D}$	$V = \frac{1274 \times Q}{D^2}$	$Re = \frac{v \times D}{1000 \times \mu}$	$f = \frac{0,25}{\left[10 \log \left( \frac{\epsilon}{3,7 \times D} + \frac{5,74}{Re^{0,9}} \right)\right]^2}$
<b>f</b> = friction factor <b>L</b> = length (m) <b>v</b> = avg. velocity <b>g</b> = 9.81 m/s <sup>2</sup> <b>D</b> = pipe Ø (mm)	<b>Q</b> = flow (l/s) <b>D</b> = pipe Ø (mm)	<b>v</b> = velocity <b>D</b> = pipe Ø (mm) <b>μ</b> = viscosity = 1,161 x 10 <sup>-6</sup> m <sup>2</sup> /s = 1 cSt	<b>ε</b> = roughness factor (mm) <b>D</b> = pipe Ø (mm) <b>Re</b> = Reynolds number

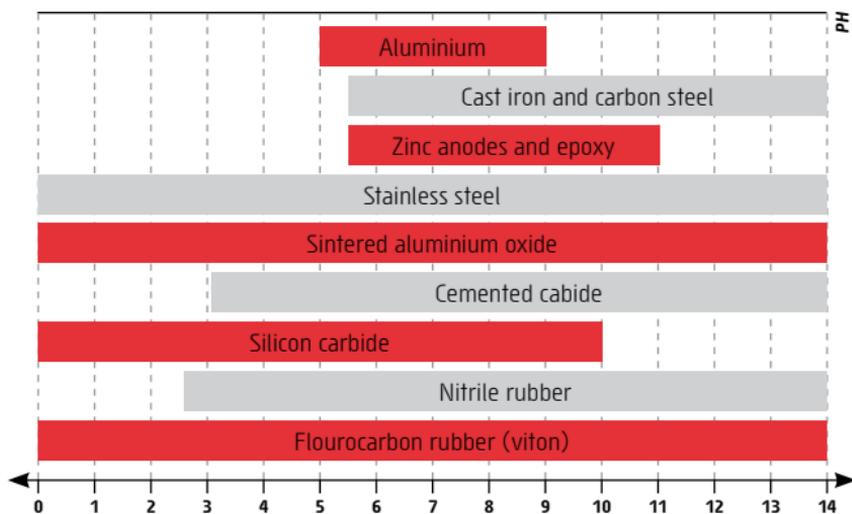
### Friction factor

Material	Cast iron	Stainless	PVC	HDPE	Concrete	Hose
ε new (mm)	0,25	0,10	0,05	0,05	0,50	0,25
ε used (mm)	1,00	0,25	0,25	0,25	3,00	1,00

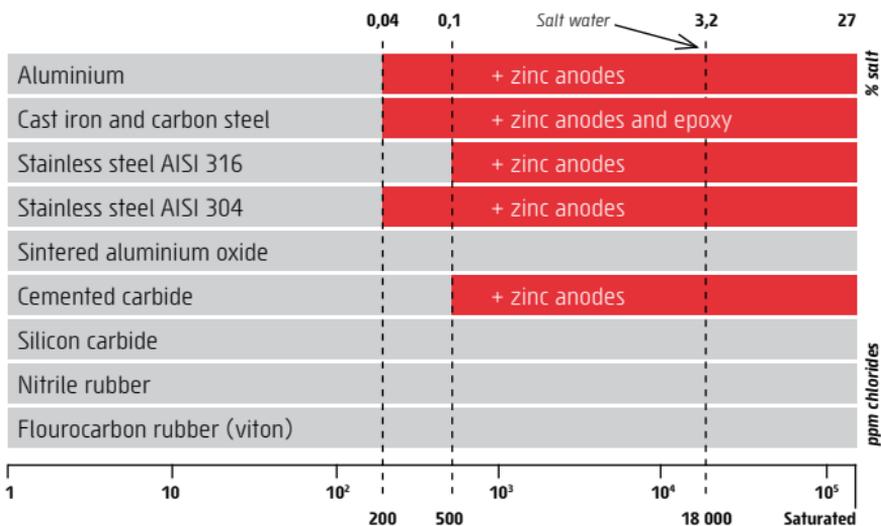
### Sludge/slurry solids concentration

By volume (C <sub>v</sub> )	By mass/weight (C <sub>m</sub> )	Mixture
$C_v = \frac{V_{solids}}{V_{solids + water}}$	$C_m = \frac{m_{solids}}{m_{solids + water}}$	$\frac{SV_{mixture}}{SV_{solids}} = \frac{C_v}{C_m}$
<b>V<sub>solids</sub></b> = volume of solids <b>V<sub>solids+water</sub></b> = total sludge volume	<b>m<sub>solids</sub></b> = mass of solids <b>m<sub>solids+water</sub></b> = total sludge mass	<b>SV</b> = Specific weight

## pH tables

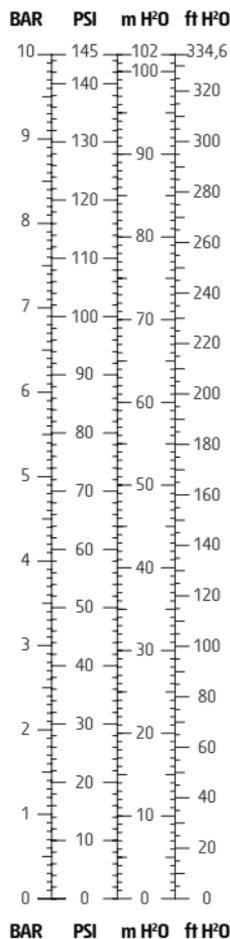


## Salt tables

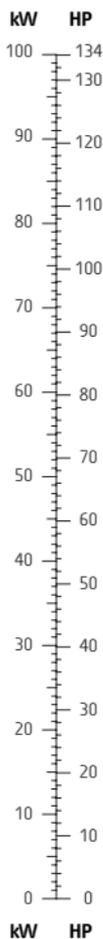


# Translation charts

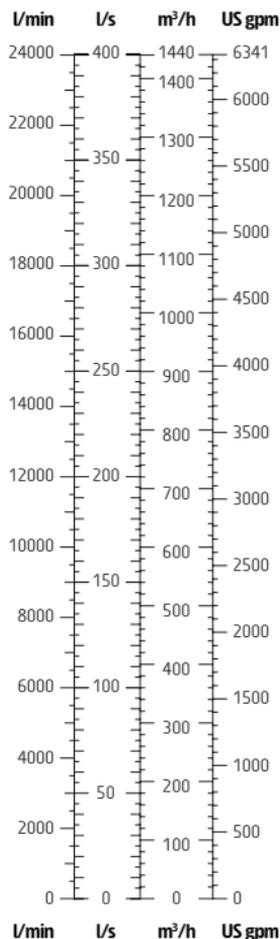
## Pressure



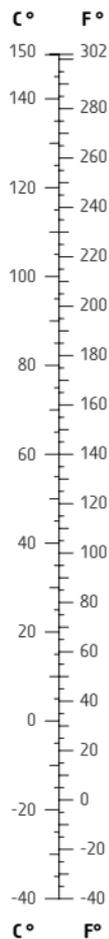
## Effect



## Flow



## Temperature



# Recommended generator sizes

Voltage 3-ph 460V 60 Hz

Pump model	Max. power consumption	Rated current	Permissible cable length	De-layed fuse	Generator set
Minex	2.4 HP/1.8 kW	2.6 A	980 ft	10 A	5 kVA
Minette	4.2 HP/3.1 kW	4.7 A	650 ft	10 A	8 kVA
Minor N H	6.8 HP/5.1 kW	7.3 A	490 ft	20 A	15 kVA
Major N H	10.3 HP/7.7 kW	11.0 A	490 ft	20 A	20 kVA
Master SH	16.0 HP/12.0 kW	16.0 A	360 ft	25 A	30 kVA
Master N H	17.5 HP/12.8 kW	18.0 A	490 ft	30 A	35*/40 kVA
Matador N H	30.0 HP/22.0 kW	31.0 A	290 ft	50 A	60*/70 kVA
Maxi N H	64.3 HP/48.0 kW	65.0 A	360 ft	100 A	120*/150 kVA
Maxi L	56.3 HP/42.0 kW	64.0 A	390 ft	100 A	110*/130 kVA
Magnum	98.0 HP/73.0 kW	107 A	360 ft	125 A	200*/250 kVA
Mega	147 HP/110 kW	148 A	520 ft	170 A	275*/350 kVA
Minette Inox	3.9 HP/2.9 kW	4.2 A	820 ft	10 A	8 kVA
Major Inox	10.1 HP/7.6 kW	11 A	490 ft	20 A	20 kVA
Master Inox	14.7 HP/11.0 kW	15 A	590 ft	20 A	30 kVA
Salvador	4.1 HP/3.1 kW	4.7 A	980 ft	10 A	8 kVA
Senior	7.64 HP/5.7 kW	8.6 A	650 ft	20 A	15 kVA
Sandy	10.3 HP/7.7 kW	11.0 A	490 ft	20 A	20 kVA
Salvador Inox	3.8 HP/2.9 kW	4.2 A	820 ft	10 A	8 kVA
Senior Inox	8.2 HP / 6.1 kW	9.0 A	650 ft	20 A	16 kVA

\*Y/D start

### Voltage 1-ph 230V 60 Hz

Pump model	Max. power consumption	Rated current	Permissible cable length	De-layed fuse	Generator set
Micro	0.85 HP/0.64 kW	2.9 A	130 ft	10 A	3 kVA
Macro	1.47 HP/1.1 kW	4.8 A	160 ft	10 A	3 kVA
Minex Lite	1.74 HP/1.3 kW	5.6 A	230 ft	10 A	4 kVA
Minex	2.4 HP/1.8 kW	8.2 A	160 ft	20 A	5 kVA
Minette	2.95 HP/2.2 kW	9.9 A	230 ft	20 A	6 kVA
Solid	1.47 HP/1.1 kW	4.8 A	160 ft	10 A	4 kVA
Salvador	2.95 HP/2.2 kW	9.9 A	230 ft	20 A	6 kVA

### Note

- In general, delayed fuse shall be dimensioned by rated current x 1.75
- The above given kVA values are meant as guidelines to simplify the choice of generator size.

Regarding size of generator set, each different type has different characteristic; therefore it is always recommended to consult the manufacturer of generator to find out if the actual generator is capable of operating the pump.

Make sure that the cable is sized to allow a voltage drop of max. 5% of the nominal voltage.

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