Pumps ▪ Valves ▪ Systems

# At work under water.
# Submersible borehole pumps from KSB.

# Long numbers. Short name. KSB.

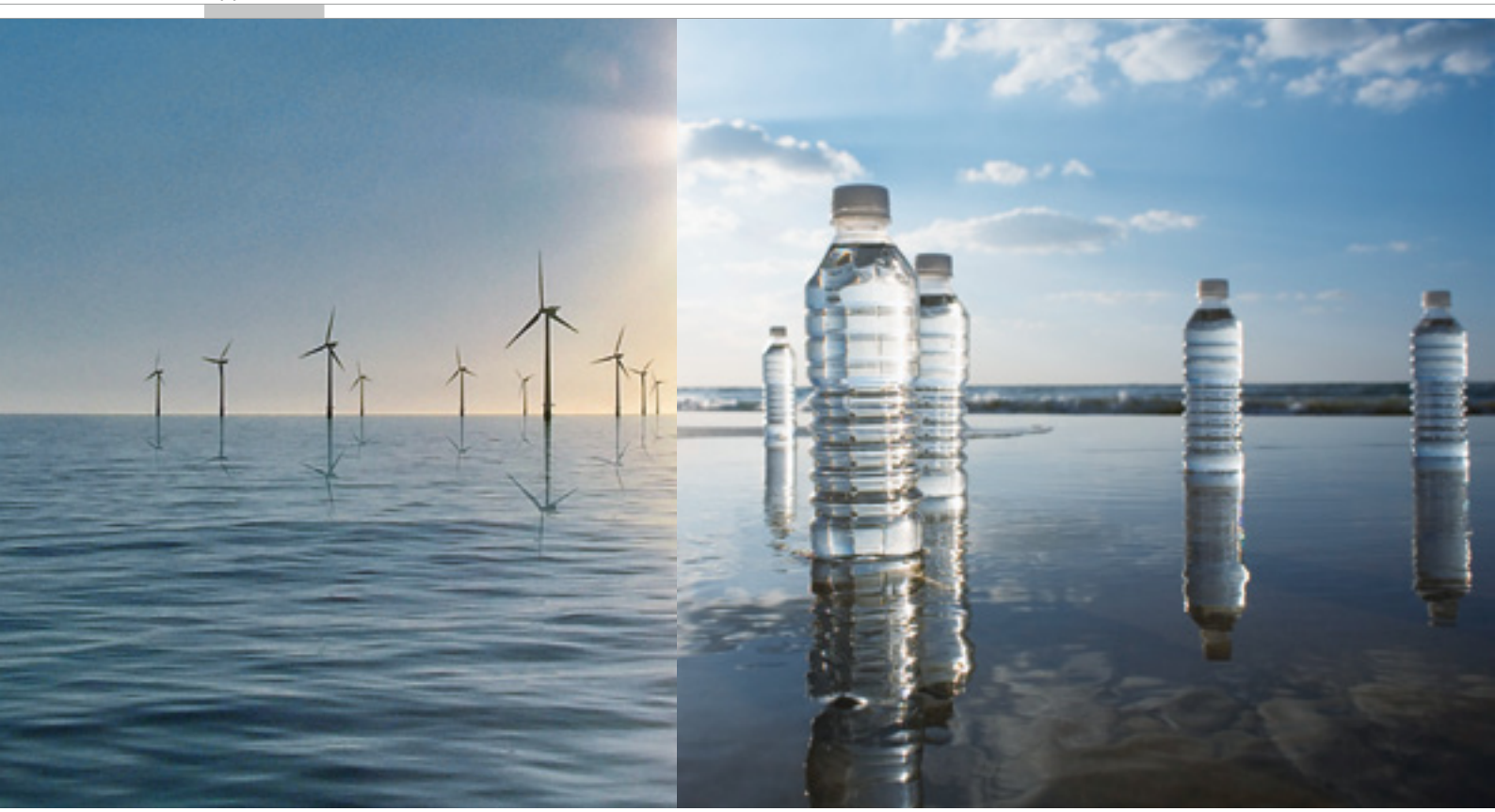
1,385,984,600 $km^3$ – that's more than $10^{21}$ litres. 1,385,984,600,000,000,000,000, in fact. Which is roughly how much water there is on earth. Every day, billions of those litres flow through pumps. And millions of those pumps are from KSB.

KSB is the world's leading all-round supplier of pumps, valves, systems and services. We've specialised in innovation, precision and application for more than 140 years. So when it comes to transporting fluids, or shutting them off, we're usually lengths ahead. And that also applies to our comprehensive service when the products are in action. Operators, consultants and engineering contractors can call on over 90 KSB service centres and thousands of our specialists – across the globe and round the clock. KSB puts its systems expertise and detailed knowledge into everything it does – from research and development through to consulting, project completion and after-sales partnering.

Reliable, economically efficient operation of your system is our top priority. So at KSB, quality comes first. You can count on our pumps, valves and systems to keep running smoothly, even in continuous operation. Because we develop our own materials, manufacture our own products, and keep testing them in our own facilities. And because over 15,500 employees around the world are all committed to meeting your needs.

# Experience you can rely on.

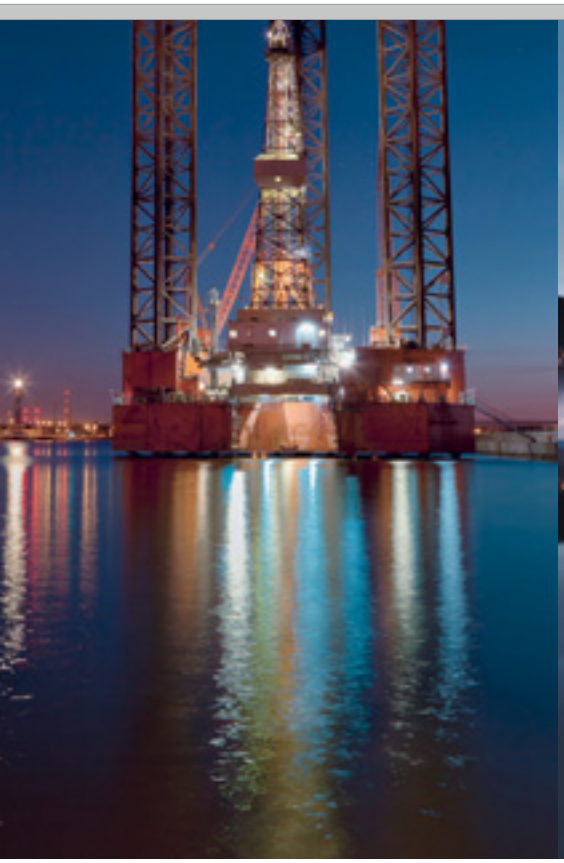
KSB has been developing and producing submersible borehole pumps for more than 80 years. So while others come and go, you can always trust us for help with consulting, engineering and operation, from the earliest phase of any project. Together, we can ensure top precision and reliability to tackle even the most complex challenges. KSB supplies the full engineering package to your specifications, and provides know-how right through to commissioning. Plus all the advice and service you need for long-term operation.



# Hard at work worldwide, 24 hours a day.

**Some of the daily tasks of KSB's submersible borehole pumps:**

- Water supply: drinking and service water
- Agriculture: irrigation and spray irrigation
- Civil engineering: drawdown of groundwater levels
- Fire protection: fire-fighting and sprinkler systems
- Offshore: seawater lift, ballast and fire-fighting pumps
- Caverns: transport of petroleum products and liquefied gas, drainage
- Mining: drawdown of groundwater levels in open and closed mines, maintenance of groundwater levels in underground mines, drainage of open-pit mines

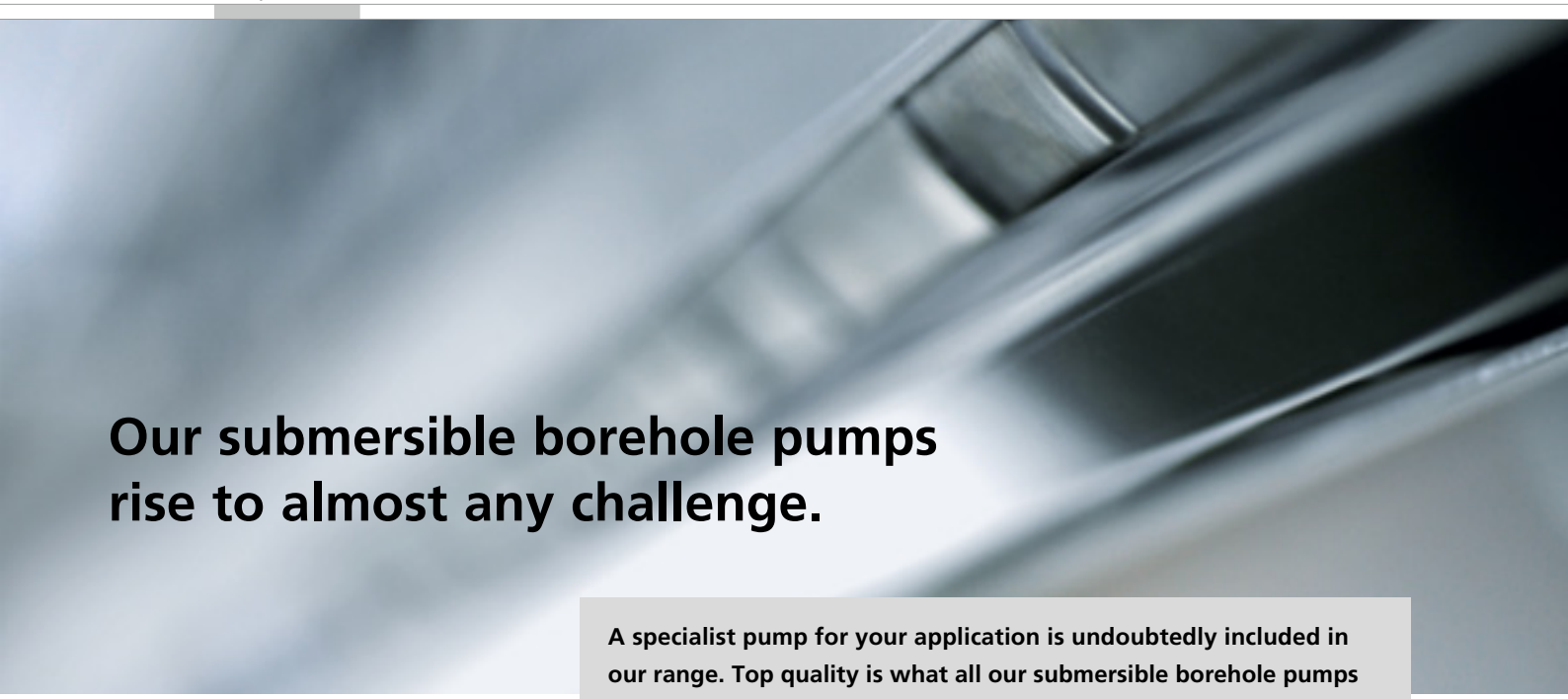


# That's what you want.
# Here's the pump to match.

Submersible borehole pumps are single-stage or multistage centrifugal pumps in shroud or ring-section design, combined with a maintenance-free motor. The pumps have a single or double entry (UPZ) and can be installed in vertical or – depending on the number of stages – also in horizontal position.

What size is your project? Whether you have to pump 1 $m^3/h$ or 2,700 $m^3/h$ – KSB's comprehensive range of submersible borehole pumps offers just the right pump for every requirement, application and project size. Depending on the type series, our submersible borehole pumps reach heads of up to 1,550 m, which corresponds to more than 150 bar. The pump sets are available for either 50 or 60 Hz and suitable voltages.

They come in a variety of materials, so we can select the exact match for your fluid handled and temperature.



# Our submersible borehole pumps rise to almost any challenge.

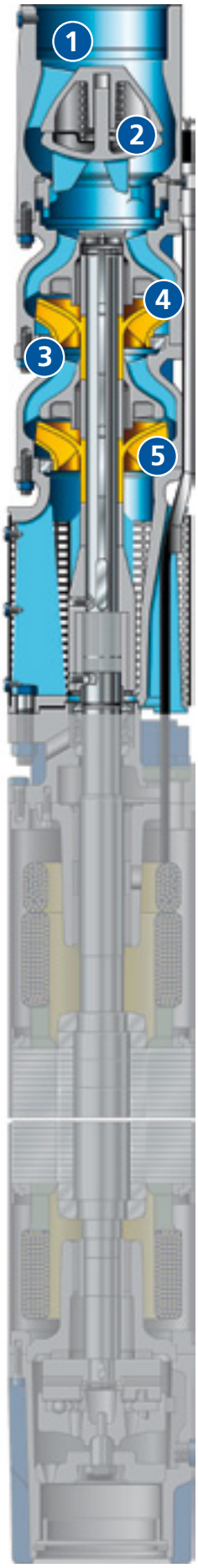
**A specialist pump for your application is undoubtedly included in our range. Top quality is what all our submersible borehole pumps have in common:**

**Submersible borehole pumps are very economical.**
They yield highest efficiencies – and keep energy costs down – thanks to their energy-saving hydraulic systems.

**Submersible borehole pumps require little maintenance.**
Once installed, they will keep running and running.
With your requirements and conditions in mind we select a material with optimum properties and resistance. The maintenance-free enclosed pump bearing protects both the shaft and the bearing against sand and other impurities, thus largely preventing wear. Abrasive wear is also prevented by the sand separator, which is integrated in some of the pump models. Your benefits are a markedly increased pump set life and excellent efficiencies.

**Submersible borehole pumps work around the clock.**
They work and work and work ...

- No jamming and tilting thanks to non-return valve with anti-blockage valve disc.
- Minimum closing times thanks to spring-loaded design. This prevents surge pressure and reduces the load on the overall system as well as its individual components.
- The counter thrust bearing of the motor reliably absorbs the negative axial thrust. This prevents the impellers from coming into contact with the stage casings during start-up of the pump set. Which increases the operating reliability.




**Submersible borehole pumps are tough.**
... And tough conditions are no obstacle.
Pumping fluids with a sand content of 50 g/m³? No problem whatsoever.

**Submersible borehole pumps are super slim.**
Their installation options are broad: from narrow wells, pump sumps and water tanks to direct placement in open waters such as rivers and lakes.

**Submersible borehole pumps have a long life.**

- Service-friendly, replaceable wear rings made of corrosion and wear resistant metal prevent wear in the clearance gaps.
- All fastening elements such as nuts, bolts and screws which are in direct contact with the fluid handled are made of stainless CrNiMo steel. Removal and refitting is easy even after years of use.
- Impeller hubs and sleeves completely protect the stainless steel pump shaft from direct wear caused by the fluid handled.

**Submersible borehole pumps are suitable for drinking water.**
For applications involving drinking water all the wetted components are tested to be suitable for drinking water. In addition they fulfil the most stringent of drinking water regulations.

1. **Pump end,** threaded or flanged, as required
2. **Check valve,** anti-blockage valve disc with double guide system
3. **Wear rings,** replaceable
4. **Pump bearing,** enclosed
5. **Energy-saving hydraulic systems** with high efficiencies

# Meet our specialists.

## S 100D, UPA 100C

4″

4″

**Applications:** Domestic water supply, irrigation and spray irrigation, draw-down of groundwater levels, fire-fighting systems, cooling circuits, fountains, pressure booster and air-conditioning systems

**Technical data:**

| | |
|---|---|
| DN | 100 |
| Q [m³/h] | 16 max. |
| H [m] | 400 max. |
| T [°C] | +30 max. |

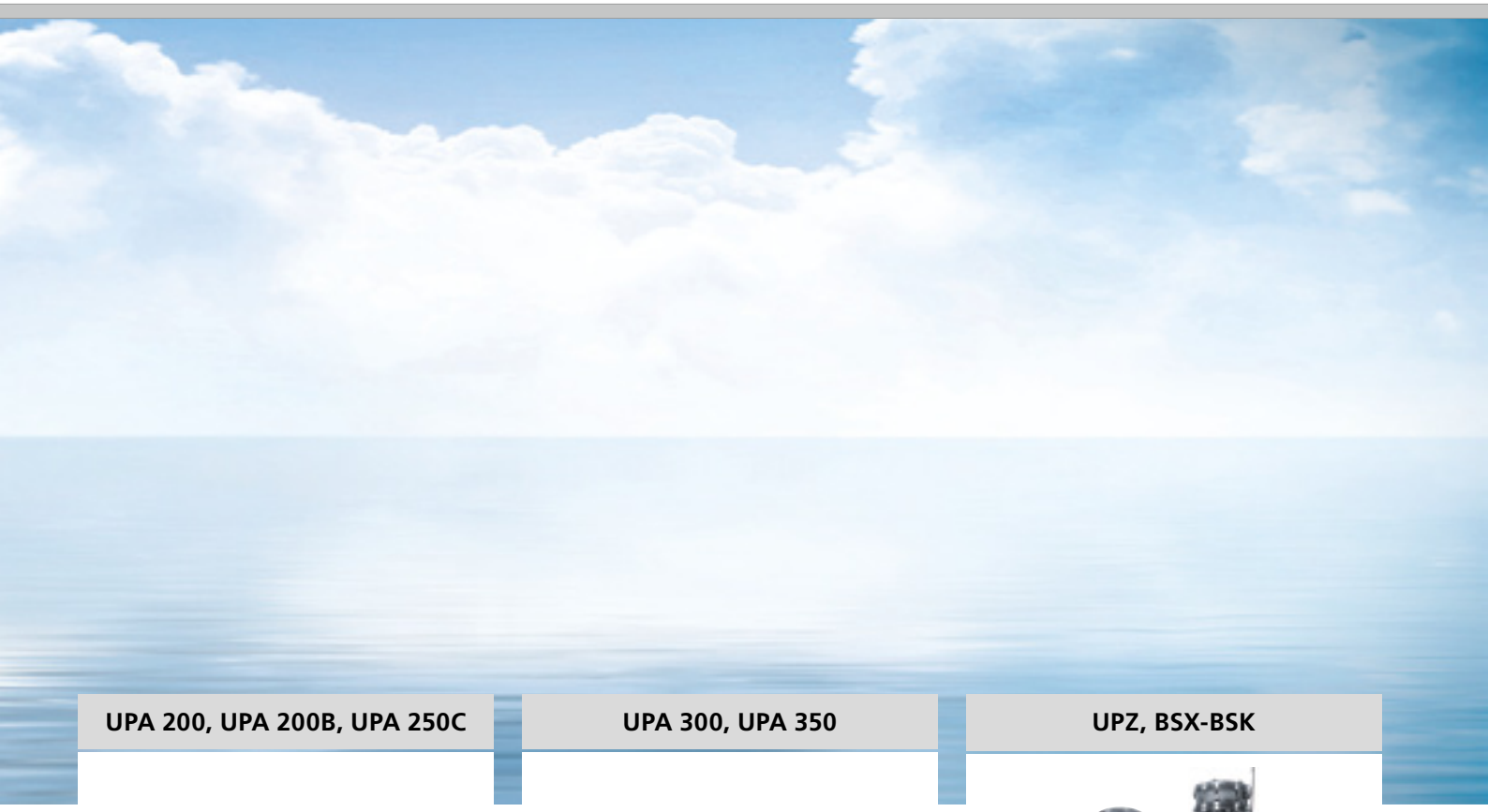
## UPA 150C

6″

**Applications:** Handling clean and slightly contaminated water, irrigation and drainage, spray irrigation, industrial and municipal water supply, drawdown and maintenance of groundwater levels, fire-fighting systems, drinking, raw and service water supply, pressure boosting

**Technical data:**

| | |
|---|---|
| DN | 150 |
| Q [m³/h] | 79 max. |
| H [m] | 570 max. |
| T [°C] | +50 max. |



## UPA 200, UPA 200B, UPA 250C

8", 10"

**Applications:** Handling clean and slightly contaminated water in general water supply, irrigation / spray irrigation, draw-down and maintenance of groundwater levels, fountains and pressure booster systems, in mining, fire-fighting systems, etc.

| **Technical data:** | | |
|---|---|---|
| | DN | 200 – 250 |
| | Q [m³/h] | 330 max. |
| | H [m] | 460 max. |
| | T [°C] | +50 max. |

## UPA 300, UPA 350

12", 14"

**Applications:** Handling clean and slightly contaminated water in general water supply, irrigation / spray irrigation, draw-down and maintenance of groundwater levels, in mines, fountains, fire-fighting systems, etc.

| **Technical data:** | | |
|---|---|---|
| | DN | 300 – 350 |
| | Q [m³/h] | 840 max. |
| | H [m] | 480 max. |
| | T [°C] | +50 max. |

## UPZ, BSX-BSK

16" – 28"

**Applications:** Handling clean and slightly contaminated water, drawdown and maintenance of groundwater levels, in mines

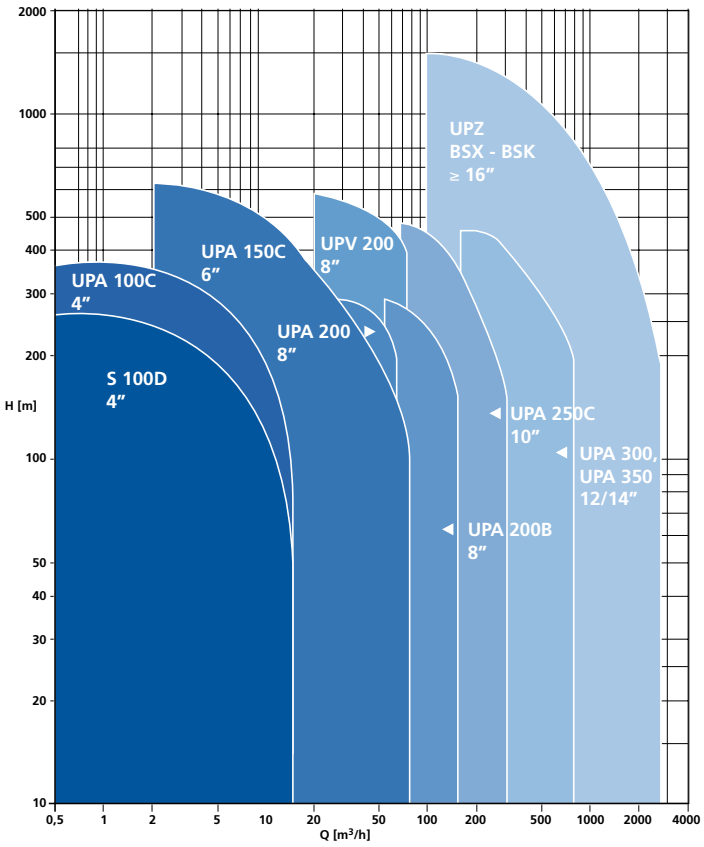
| **Technical data:** | | |
|---|---|---|
| | DN | > 350 |
| | Q [m³/h] | 2700 max. |
| | H [m] | 1500 max. |
| | T [°C] | +50 max. |

The above data refers to 50 Hz models. 60 Hz models are also available.

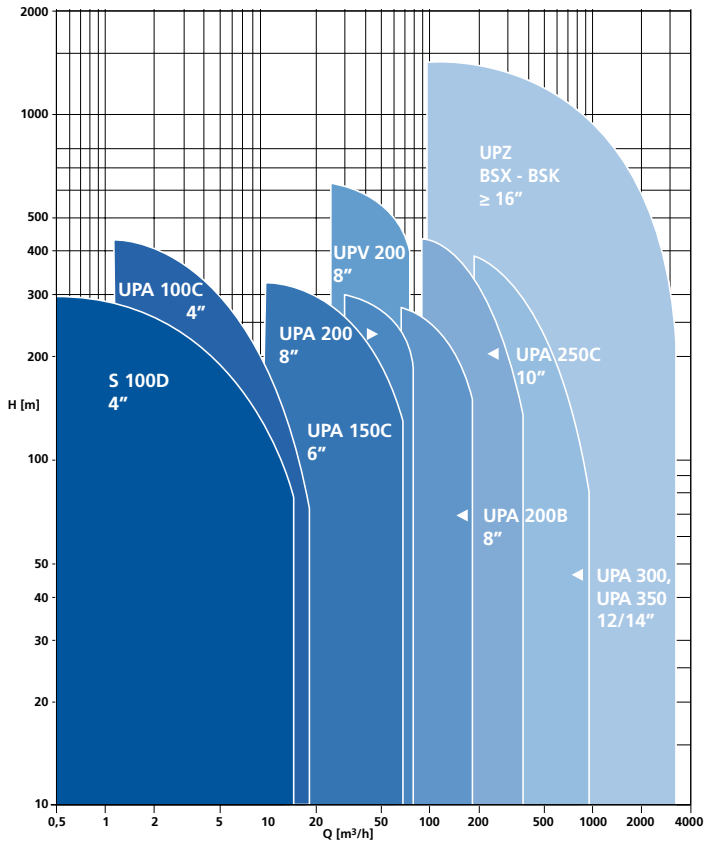
# Choose the expert.
# There’s one for every task.

What is your operating range? To match that range, have a look at our selection charts. Out of the matching submersible borehole pumps we will recommend the ideal pump. Ideal in operating data and materials — this is how you benefit from our extensive portfolio.

**Hydraulic selection chart of our 50 Hz pumps:**



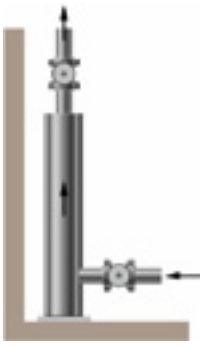

**Hydraulic selection chart of our 60 Hz pumps:**



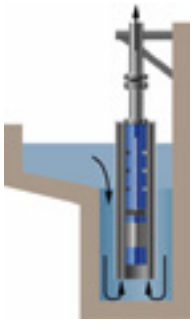
# A perfect fit – whichever way you look at it.

Submersible borehole pumps are generally designed for vertical installation, for example in wells.
But they can also be installed horizontally in tanks or reservoirs, or even at angles anywhere between 0° and 90°.
In other words: anyway you want them.

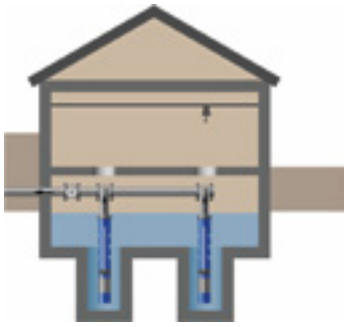
**Here are only some of the installation options of our submersible borehole pumps:**



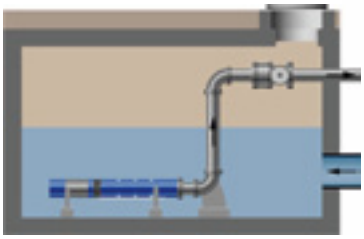
Vertical pressure shroud



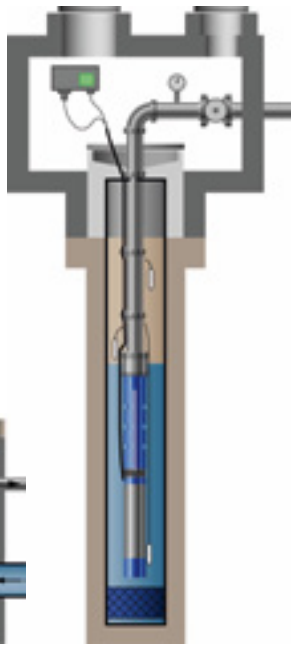
Intake structure



Parallel operation



Horizontal installation



Wells

# The heart that beats them all: submersible motors from KSB.

**For more than 80 years KSB has been fitting pump sets with motors for the tough, long-lasting and maintenance-free use under water:**

- **4" encapsulated motors**
- **Motors 6" and larger which are rewindable and water-filled**

You can choose from a variety of materials which are matched exactly to your operating conditions, such as the fluid handled and temperature.

All motors are characterised by excellent efficiencies to keep your operating costs to a minimum. The motors are durable, maintenance-free and perfectly matched to the specific pump and its application. No flow past the motor is required for fluid temperatures of up to 60 °C. The motor fill provides protection against frost up to –15 °C.
The motor connections comply with the corresponding NEMA standard (4" – 8").

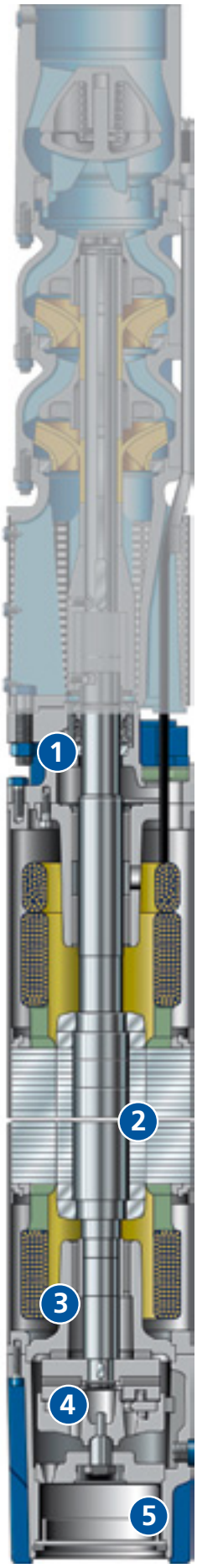
The motors are fitted with a high-quality mechanical seal and a diaphragm for equalising any pressure differences between the motor and its environment. The overall design is compliant with the relevant VDE standards.

KSB submersible motors are thoroughly tested in complex procedures under real operating conditions.

**▪ Motors larger than 12"**

**Additional features for all motors of 12" and larger:**

- **Double shroud for circulation cooling**
- **Winding insulation (J2) for maximum heat resistance**
- **Optimised cooling pump for preventing temperature peaks**




**Submersible motors for maximum performance.**
KSB motors achieve an efficiency of up to 91 %. They are designed for maximum pump input power and thus protected against overloading. The motors comply with the relevant VDE standards and ensure a high level of electrical safety.

**Submersible motors for a long service life.**
The wear-resistant mechanical seal with sand thrower ensures a long motor life and high operating reliability.

**Submersible motors for optimum reliability.**
The counter thrust bearing reliably absorbs the negative axial thrust and prevents the impellers from coming into contact with the stage casings.

**Submersible motors for more dependability.**

- Pressure equalisation system with optimum rubber diaphragm design for maximum immersion depths.
- Stator and screws are made of stainless steel.
- All wetted components have been approved for handling drinking water.

**Submersible motors for maximum operating reliability.**
The proven, maintenance-free thrust bearing is designed for maximum load capacity in continuous operation. It is a water-lubricated plain bearing, fitted with self-aligning tilting pads. Its stainless steel/carbon material combination provides additional safety.

**And the balanced rotor makes sure the pump set runs smoothly.**

1. **Mechanical seal** for sealing the motor
2. **Rotor,** dynamically balanced
3. **Counter thrust bearing** prevents rubbing contact of impellers
4. **Thrust bearing,** maintenance-free with self-aligning tilting pads
5. **Pressure equalisation system** for maximum immersion depths

# Motors with a mission.

## Portfolio of 4" to 24" submersible motors

Overview of KSB's submersible 50 Hz and 60 Hz motors from 4" to 24"

| Size | 50 Hz (60 Hz) to 1 kV (to 1 kV) 2 poles | 50 Hz (60 Hz) to 1 kV (to 1 kV) 4 poles | 1 kV to 3 kV (1 kV to 4.16 kV) 2 poles | 3 kV to 6.0 kV (4.16 kV to 6.6 kV) 2 poles | 1 kV to 3 kV (1 kV to 4.16 kV) 4 poles | 3 kV to 6.0 kV (4.16 kV to 6.6 kV) 4 poles |
|---|---|---|---|---|---|---|
| 24" | | | 1600 kW (1600 kW)<br>EBD<br>900 kW (900 kW) | 1600 kW (1600 kW)<br>EBD<br>900 kW (900 kW) | 2000 kW (2000 kW)<br>EMD<br>900 kW (1200 kW) | 2000 kW (2000 kW)<br>EMD<br>900 kW (900 kW) |
| 19" | | | 1000 kW (1200 kW)<br>ZBD<br>650 kW (780 kW) | 1000 kW (1050 kW)<br>ZBD<br>650 kW (780 kW) | 800 kW (800 kW)<br>ZMD<br>400 kW (480 kW) | 800 kW (800 kW)<br>ZMD<br>400 kW (480 kW) |
| 16" | | | 830 kW (950 kW)<br>XBD<br>400 kW (480 kW) | 700 kW (800 kW)<br>XBD<br>260 kW (330 kW) | 500 kW (600 kW)<br>XMD<br>280 kW (340 kW) | 450 kW (550 kW)<br>XMD<br>220 kW (340 kW) |
| 14" | 600 kW (720 kW)<br>14D ... 3/2<br>250 kW (300 kW) | 400 kW (480 kW)<br>14D ... 3/4<br>150 kW (190kW) | 400 kW (480 kW)<br>VBD<br>140 kW (170 kW) | | 400 kW (460 kW)<br>VMD<br>170 kW (200 kW) | |
| 12" | 400 kW (420 kW)<br>UMA 300D ... /22<br>250 kW (300 kW) | 280 kW (300 kW)<br>UMA 300D ... /42<br>175 kW (210 kW) | 300 kW (360 kW)<br>TCD<br>170 kW (240 kW) | | | |
| 10" | 190 kW (228 kW)<br>UMA 250D ../22<br>UMA 250D ../21<br>85 kW (102 kW) | | | | | |
| 8" | 90 kW (108 kW)<br>UMA 200D ../22<br>UMA 200D ../21<br>37 kW (45 kW) | | | | | |
| 6" | 37 kW (44 kW)<br>UMA 150D ../22<br>UMA 150D ../21<br>5.5 kW (6.6 kW) | | | | | |
| 4" | 7.5 kW<br>3~motor DN100<br>0.37 kW<br>2.2 kW<br>1~motor DN100<br>0.37 kW | | | | | |

Key:

$f_N$ → 50 Hz (60 Hz)

*Max. $P_N$ → 90 kW (108 kW) UMA 200D ../22 / UMA 200D ../21

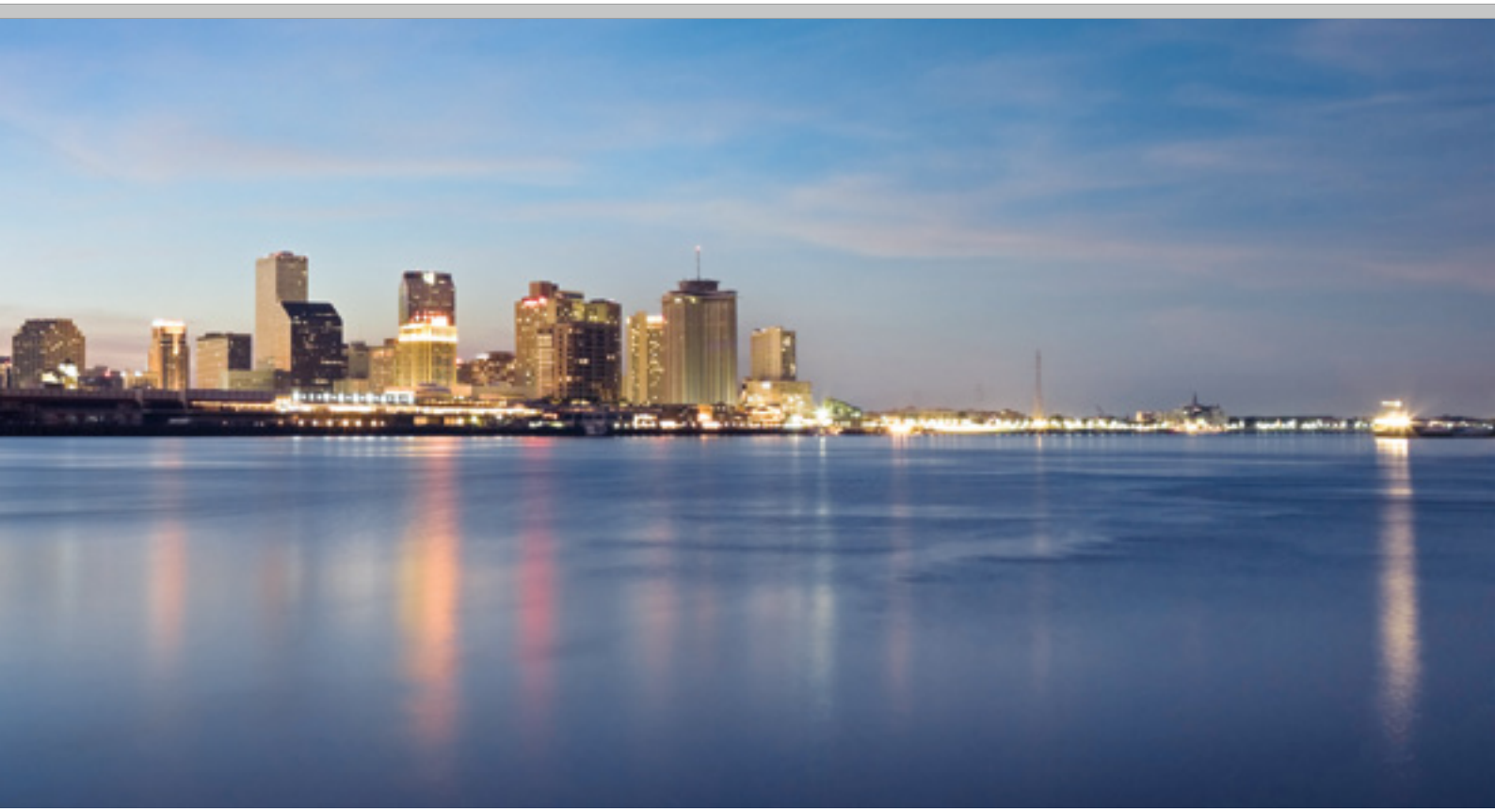
*Min. $P_N$ → 37 kW (45 kW)

→ $T_{U\,Max}$ = 50 °C

→ $T_{U\,Max}$ = 30 °C

* Per size

Special designs and models for higher voltages on request



# Tough times for pumps: the KSB test bed.

Compromises? Not with us! At KSB the most stringent of quality guidelines are applied to each and every step, from the design phase through to mounting the motor and coating the pump. But it gets tougher yet: The pumps still have to prove themselves in the test bed, at immersion depths as deep as 17 metres.

The two KSB test beds replicate every minute detail of the actual operating conditions. Both test beds are open-loop systems. On request, they can also be used to conduct vibration measurements and NPSH tests.

Our quality control and final production checks are the key to our pumps' reliable performance.

If you have requested a hydraulic performance test, we will provide you with a meaningful test report containing all measured and calculated values, including all H/Q data, the efficiency and a characteristic curve.

Would you like to see it for yourself? Watch your pump being put to the test.

**We test pumps up to:**

Flow rate Q max.: 3000 m³/h
Head H max.: 1600 m
Maximum motor rating: 3500 kW at 50 Hz; 4500 kW at 60 Hz
Maximum speed: up to 3600 rpm
Maximum voltage: 7.5 kV
Maximum diameter of pump end: DN 900

The pumps are tested to ISO 9906.

# Water supply: transport as varied as its use.

All water is not the same. We base the material selection of our submersible borehole pumps on water analyses provided by our customers. Our range of materials spans from grey cast iron, bronze, aluminium multi-alloy bronze and chromium steel, to duplex and super duplex stainless steels.

**Drinking water supply**
Extracting groundwater to supply cities and municipalities with drinking water.

**Service water supply**
Extracting groundwater to supply industrial companies with service water.

**Seawater supply**
Extracting bank-filtered seawater from wells for drinking water treatment plants e.g. reverse osmosis systems.

**Irrigation and spray irrigation**
Extracting groundwater from wells to irrigate agricultural land, parks and landscaped areas. The water is pumped into open channels or storage tanks, or it is directly fed into spray irrigation systems.

**Drawdown and maintenance of groundwater levels**
In some areas the groundwater level is very high and has to be lowered permanently or for a specific period of time – e.g. to carry out underground work. Sometimes land which was originally dry is affected by rising groundwater levels. In this case, submersible borehole pumps can lower the groundwater to a safe level and protect any existing buildings.

**Pressure boosting**

For use as pressure boosters submersible borehole pumps can be installed in vertical or horizontal pressure shrouds. This type of installation results in low-noise operation, and it is flood-proof.

**Fountains**

Due to their slim design and small space requirements submersible borehole pumps are an ideal solution for fountains and fountain shows.

**Snow-making systems**

Winter sports areas cannot survive without snow. If there is a lack of natural snow fall, snow-making systems make sure that winter sports activities can still go ahead. Submersible borehole pumps supply water to the snow-making systems, which — at freezing temperatures — convert the water into man-made snow.

**A comprehensive range of accessories is available for water supply applications:**

- Power cables
- Cable connectors
- Cable clips
- PumpDrive
- Automatic control units
- Dry running protection, semi and fully automatic
- Adapters
- Supporting and installation clamps
- Bearing pedestals
- Centring devices
- Cooling, suction or pressure shrouds
- Control cabinets, and much more

# Caverns/mining/offshore.

**Caverns**
Our submersible borehole pumps transport petroleum products and liquefied gas. They are also used for drainage.

**Mining**
Submersible borehole pumps are used in open and closed mines for the drawdown and maintenance of groundwater levels as well as for drainage.

**Offshore engineering**
Submersible borehole pumps are employed as seawater lift, ballast and fire-fighting pumps.

Depending on the project and the specific requirements we supply submersible borehole pumps in the most diverse of materials, from simple grey cast iron, bronze, aluminium multi-alloy bronze and chromium steel to duplex and super duplex stainless steels. In close cooperation with the customer we design quality and production plans in which we define the required quality standard. This standard is implemented and documented for every single procedure involved.

Our submersible borehole pump experts will be pleased to assist you at any stage of your project, from planning through to installation and service.

**A comprehensive range of accessories is available for applications in caverns, mining and offshore:**

- Rising mains
- Well heads
- Cable holders
- Centring devices
- Pipes for chlorination
- Water storage tanks
- Terminal boxes for power cables
- Motor temperature monitoring, and much more





# KSB services: global, local, whenever, whatever.

Our KSB experts for submersible borehole pumps and the corresponding applications will be there when you need them. Consultation and comprehensive services are offered worldwide.

You will benefit from the synergy effects of highly competent specialists, test beds and state-of-the-art technology coming together on the same site: Homburg/Saar, Germany, is home to the KSB Service GmbH as well as to the pump and motor production.

**KSB services at your disposal:**

**Optimising system designs to minimise energy consumption**
This is how you can make sure that, in times of rising energy costs, your groundwater extraction system is and remains economical: Our service engineers conduct measurements at your site, so they can tell you the exact overall efficiency of your well system, or in other words, how economical it is. They will also point out specific areas in which more energy is consumed than necessary and savings can be made.

**There is a lot to be gained:**

- A valuable overview of the efficiency of groundwater extraction from your well
- A reliable quantitative approach for lowering operating costs
- A payback analysis providing you with the facts for sound economical decisions
- A clear and concise, reliable statement on where you can save on power bills

**Commissioning**
We supervise your system being commissioned, making sure it is a smooth process from start to finish: from examining the existing conditions in detail, thoroughly monitoring all of the individual installation processes right through to supervising your pump's premiere at the time of commissioning. We also train your staff.

**Optimising, adjusting, monitoring and repairing pumps and motors**
Sometimes system conditions change over time: We re-adjust and optimise your pump accordingly. We also regularly check your pump and its motor and carry out any required repairs – regardless of the make!

**Pump and motor analysis**
We take measurements on site for a comprehensive as-is analysis of your system. Based on the information gained we calculate the optimum operating point and select the ideal pump – and we optimise your system.

**Transient flow analysis**
We conduct precise surge calculations during the planning stage and recommend optimum protective measures to maximise the operating reliability of your system.

**Comprehensive accessories**
We offer a comprehensive range of accessories for both standard and engineered products. We will be pleased to help you choose!

**Certifications**
KSB's submersible borehole pumps are manufactured in compliance with the international Standards ISO 9001, ISO 14001 and BS OHSAS 18001.

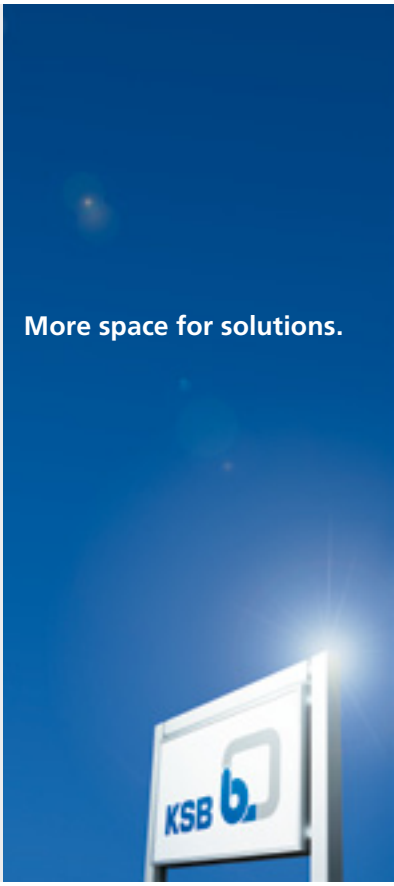
**What can we do for you?**

Don't hesitate to give us a call to discuss any details of your project or your requirements on a high-efficiency submersible borehole pump, or if we can provide you with further information.

Subject to technical modification without prior notice

Your local KSB representative:

**The KSB Newsletter –**
Log in now on:
**www.ksb.com/newsletter**

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