Centrifugal Pumps in Underground Mining
In underground mining the mine water has to be collected at certain points and from there to be pumped to the surface. This is achieved by means of large, multi-stage high pressure centrifugal pumps.

DÜCHTING pumps are able to pump mine water from great depths, 1700 m and more, from the main water drainage station to the surface in one large set of pumps. By means of this system the expensive pumping of mine water from level to level is avoided and the possibility of automation is eased and economized.

For almost 50 years DÜCHTING have been the specialists for mine drainage pumps in Germany. Because of the long experience the pumps are robust and simple, and the materials, they are made of, were chosen to suit to the mine water.

Consulting, design of pumps and their control, as well as their installation are part of the service.

For the secondary mine drainage and mine air cooling DÜCHTING make high pressure centrifugal pumps as well as submersible and armoured pumps.

Within their programme for mine drainage pumps DÜCHTING also offer high pressure centrifugal pumps and armoured pumps for hydraulic (hydro-mechanical) mining.

Besides this large programme for underground mining we also design and make special pumps to your specifications.

**Fields of application:**
- High pressure centrifugal pumps
  - Main and secondary mine drainage,
  - Mine air cooling
- High pressure centrifugal pumps
  - Secondary mine drainage,
  - Mine air cooling
- Submersible pumps
  - Feed pumps in main and secondary mine drainage
- Armoured volute pumps horizontal and vertical
  - Transport of liquid mixtures containing solids

**Line HK/MHK**

**Field of application:**
DÜCHTING HK high pressure centrifugal pumps are especially suitable for hoisting contaminated and aggressive mine water. High pump heads can be achieved at normal speed of 1500 rpm. Pump sizes for 3000 rpm are also available.

**Construction:**
DÜCHTING HK pumps are compact, multi-stage, centrifugal pumps, segmental type, with hydraulic balance device.

The heavy, robust pump has been adapted to the rough and confined operating conditions underground, which means, it can easily be assembled and dismantled. Square to the shaft the casing is divided into separate segments, which are sealed by O-ring type sealing rings. The segments of the casing are kept tightly together by sturdy external connecting bolts.

The shaft runs on both sides in large dimensioned, grease-lubricated anti-friction bearings. The occurring forces are taken up by solid bearing shells, flanged to the suction and pressure casing.

If desired, the suspension can be fitted with oil-lubricated antifriction bearings and also with slide bearings.

As shaft sealing we offer a wear resistant stuffing or a mechanical seal insensitive to dust. In both designs the shaft is protected in the sealing area by easily exchangeable shaft protection sleeves.

**Technical data:**
- Nominal width: DN 40 to DN 300
- Delivery head: up to 1700 m
- Capacity: up to 1300 m³/h

**Sectional view HK/MHK**

The occurring axial thrust is absorbed by a device balancing the complete rotating assembly (disc - counter disc), the operational wear of which is indicated by an external thrust indicator.

When designing the HK line, especial value was set on good mounting and dismantling characteristics. So all essential wearing parts, as impellers and diffusers, balance and counter balance disc, shaft protection sleeve, wear rings, etc. are designed as easily exchangeable individual components.

The various analyses of different mine waters make the use of special in parts highly alloyed materials necessary in order to achieve economical service lives and the necessary operational reliability.

The pumps are equipped with all necessary connections for fully automatic operation.
**Mine Drainage Pumps**

**Performance characteristics – Line HK**

- **Speed:** 2960 l/min
- **Density:** $10^3$ kg/m³

**Mine drainage**

**Secondary mine drainage**

**Mine air cooling**

DÜCHTING HK 10 pumps are multi-stage high pressure centrifugal pumps, segmental type, with single impeller balance. This type takes a special place within the superordinate Line HK. As a high pressure centrifugal pump it is applied in secondary mine drainage and mine air cooling in almost every colliery in Germany.

Suction and pressure casing of HK 10 are so designed that a lantern, to be flanged to the motor, can be attached. By this arrangement possible alignment errors are avoided.

By the installation of varying sets of impellers and diffusers a broad range of capacity is achieved.

**Technical data:**

- **Pressure joint:** DN 100
- **Opt. vol. flow rate:** 30, 60 or 90 m³/h
- **Max. number of stages:** 13
- **Suction joint:** DN 125
- **Head:** 25 m/stage
- **Speed:** 1475 l/min

**Sectional view HK 10 SE**

- Suction casing
- Stage casing
- Pressure casing
- Shaft bushing
- Shaft bearing housing
- Impeller
- Diffuser
- Axial gland
- Mechanical seal
- Shaft seal

**Performance characteristics**

- **Speed:** 1475 l/min
- **Density:** $10^3$ kg/m³
**Line LHK/VLHK**

**Field of application:**
DUCHTING LHK high and medium pressure centrifugal pumps are preferably used in secondary mine drainages and mine air cooling systems. The vertical type VLHK has proved its value as a feed pump in main mine drainages and similar applications.

**Construction:**
LHK/VLHK pumps are multi-stage, horizontal/vertical centrifugal pumps, segmental type, with single balanced impellers. Impellers, diffusers, wear rings and shaft protection sleeves are exchangeable.
In the horizontal type, the pump shaft is suspended on the suction as well as on the pressure side in external, grease-lubricated anti-friction bearings.
Shaft sealing is achieved by choice: by stuffing box or mechanical seal.
The applied materials suit to the handled liquid.

**Technical data:**
- Nominal width: DN 32 to DN 400
- Feed pressure: up to 35 bar
- Capacity: up to 3000 m³/h

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**Line VK**

**Field of application:**
DUCHTING VK pumps are mainly used as feed pumps in mine drainages especially when large quantities of water are to be pumped to low discharge heights.

**Construction:**
- Single- or multi-stage, vertical stage casing pumps, tubular type, with single balanced, mixed impellers.
- Shaft sealing by stuffing box or mechanical seal.
The applied materials suit to the handled liquid.

**Technical data:**
- Nominal width: DN 150 to DN 300
- Head: up to 120 m
- Capacity: up to 1200 m³/h

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**Line ROWA**

**Field of application:**
Handling of aggressive and/or abrasive liquids as occur in secondary mine drainages and shaft pumps.

**Construction:**
ROWA pumps are horizontal volute pumps with inner plates on both sides.
The closed or semi-open radial flow impeller, mounted overhung on the pump shaft. The shaft is suspended on strong anti-friction bearings, which transfer the occurring forces on to the heavy bearing bracket.
Shaft sealing by stuffing box or mechanical seal.
The robust construction of the pump meets the special conditions underground.

**Technical data:**
- Nominal width: DN 32 to DN 700
- Head: up to 100 m
- Capacity: up to 10,000 m³/h

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1) For detailed information see LHK-Report
To ensure that our centrifugal pumps meet quality assurance standards, it is necessary to subject the machines to a test run before they leave the factory. In most cases this involves documents confirming performance and an acceptance test (according to national international standards) performed in the presence of the customer. For this purpose and with this objective, work was carried out over many years on a concept based on the latest findings.

Following our experience assessment of standards and future proposals our test facility was completely upgraded in 1990. The pipeline system of the test facility is designed for a maximum flow rate of 10000 m³/h and a delivery pressure of 160 bar. A variety of calibrated three phase motors up to 2000 kW output with different speeds of between 600 - 3000 rpm are available to drive the centrifugal pumps. A wide range of turbo-machines can be tested for all acceptance and test series parameters.

The test facility can also be made available to other companies for the above-mentioned possibilities.

The recording, evaluation, documentation and archiving of all measured values takes place centrally via a computer at the measuring station.