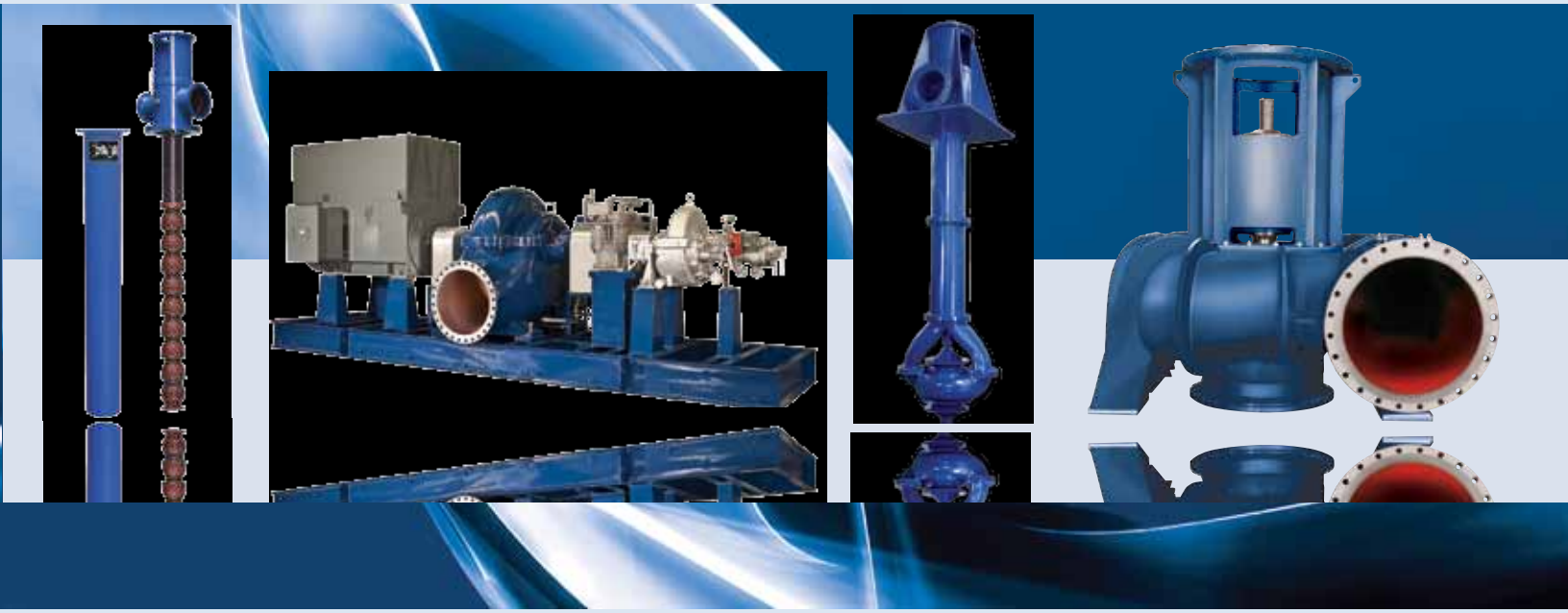
RUHRPUMPEN

Specialist for Pumping Technology

INNOVATION
EFFICIENCY
QUALITY

Water & Wastewater Market



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Water and Wastewater Market

For more than 60 years the name Ruhrpumpen™ has been synonymous worldwide with innovation and reliability for pumping technology

Ruhrpumpen

Ruhrpumpen is an innovative and efficient centrifugal pump technology company and offers operators of Pump Systems, a wide range of quality products. Ruhrpumpen is committed to global excellence with a complete range of Pumps, Fire Pump packages and related products, such as Decoking Systems and Tools to support the core markets, namely Oil & Gas, Petrochemical, Power, Heavy Industry applications, Mining and Water services. The broad product line complies with the most demanding quality specifications and go beyond stringent industry standards such as API, ANSI, Hydraulic Institute, Underwriter's Laboraties, Factory Mutual and ISO 9001.

Ruhrpumpen is a vertically integrated company with its own foundry, machine shop, pump manufacturing plants, and service centers. With strategically located manufacturing plants, operating offices, and service centers in many parts of the world, Ruhrpumpen truly is a global pump company with the strength to focus on the local necessities of each client.

Pumping quality to meet Water Industry needs

With more than 60 years of experience and pumps installed in more than 90 countries, Ruhrpumpen has the experience you can count on.

Recent statistics show that global water consumption has increased at twice the rate of population growth, and meeting this demand has become a key challenge worldwide, both environmentally and economically. Ruhrpumpen has a complete line of reliable pump solutions for water and wastewater applications.

Ruhrpumpen has pump solutions for the following Water Industry applications:

- Water Treatment & Distribution
- Wastewater
- Flood Control and Drainage
- Lake or River Water Intake
- Makeup Water
- Raw Water
- High Service
- Finished Water
- Booster
- Secondary Recovery
- Corrosive Water Services, Seawate, Brackish Water
- Aquifer Storage and Recovery
- Desalination
- Screen Wash

WATER PUMPS

VTP – Vertical Turbine Pumps

VTP pumps are normally designed to operate in wells or sumps. Ruhrpumpen has many installations of this pump type in the municipal market. Fluids this pump can handle: water, cooling water, river water, sea water, process water and deepwell.

PRODUCT DESCRIPTION

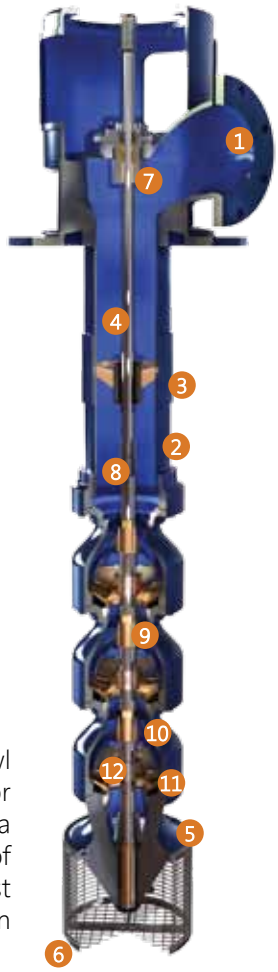
- Multi-stage vertical centrifugal pump with diffuser type bowl
- Francis vane enclosed impellers
- Counter clockwise rotation viewed from coupling end
- Large bowl shaft sizing provides longer life
- Also available with submersible motor configuration

PERFORMANCE DATA

Capacity	up to 60, 000 US. gpm	13,630 m^3/h
Head	up to 2,500 feet	762 m
Pressure	up to 1,080 psi	74 bar
Temperature	up to 250 °F	121 °C

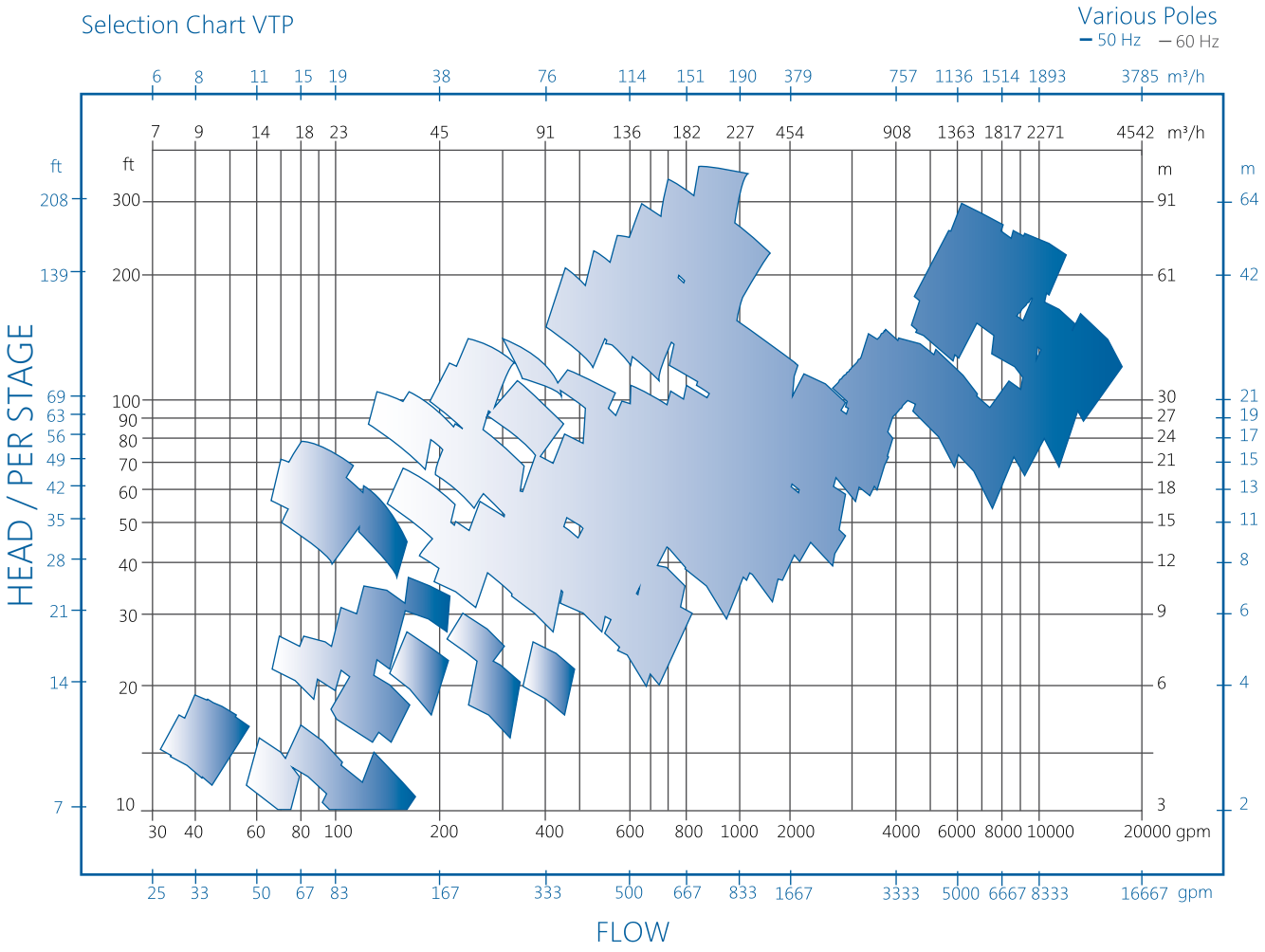
Note: For pump operations outside this range, please contact a Ruhrpumpen Representative.

Optional features include bowl and impeller wear rings for extended impeller life, and a keyed impeller for ease of disassembly and thrust balancing to reduce strain on the driver assembly.



1. Discharge head provides support for entire pump and column assembly. As well as the driver, available in cast iron, fabricated steel or a variety of optional materials.
2. Columns are flanged or threaded, and available as product-lubricated or with the enclosing tubes for oil, or water flushed lubrication.
3. Column assemblies are manufactured to assure accurate fit, and are available in a variety of materials and coatings.
4. Line shafts are turned, ground, and polished carbon steel with ends faced and threaded. Other materials available for special applications.
5. Suction bell is cast iron with integral straightening vanes to prevent turbulence. Other materials available for special applications.
6. Strainer (optional) prevents entry of foreign objects into pump suction.
7. Machined stuffing box for mechanical seals or packed stuffing box with bushing to maintain proper shaft alignment.
8. Bearings are available in a variety of materials to meet pumping requirements.
9. Shaft couplings bored and threaded from precision forged steel bar.
10. Sleeve bearings operate in conjunction with the pump shaft to provide proper alignment and maintain hydraulic clearances.
11. Enclosed impellers are designed for long life and high efficiency. Each is precision machined and balanced for vibration-free operation.
12. The tapered collet (standard) secures the impeller to the pump shaft.

Performance Range



To see more features of this pump, please see the VTP brochure, or contact a Ruhrpumpen representative.

VAF- Vertical Axial Flow Pumps

This is the perfect pump for applications that require large volumes of water with low head, such as drainage, waste water, flood control, irrigation, waste treatment plants, underpass drainage, condenser cooling, construction dewatering, ditch pumps and raw water intakes.

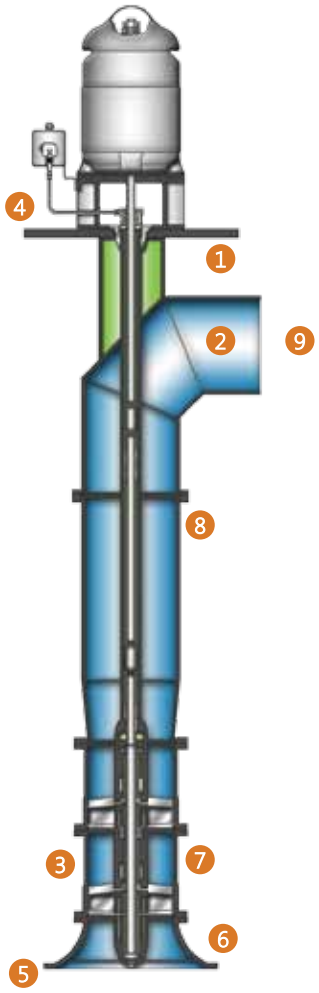
PRODUCT DESCRIPTION

- Single or multi-stage vertical centrifugal pump with diffuser type bowl
- Axial flow impeller, high efficiency
- Handles solids up to 14” in diameter (356 mm)
- Counter clockwise rotation viewed from shaft coupling

PERFORMANCE DATA

Capacity	up to 320, 000 US. gpm	72,700 m^3/h
Head	up to 90 feet	28 m
Pressure	up to 75 psi	5.2 bar
Temperature	32 to 203 °F	0 to 95 °C

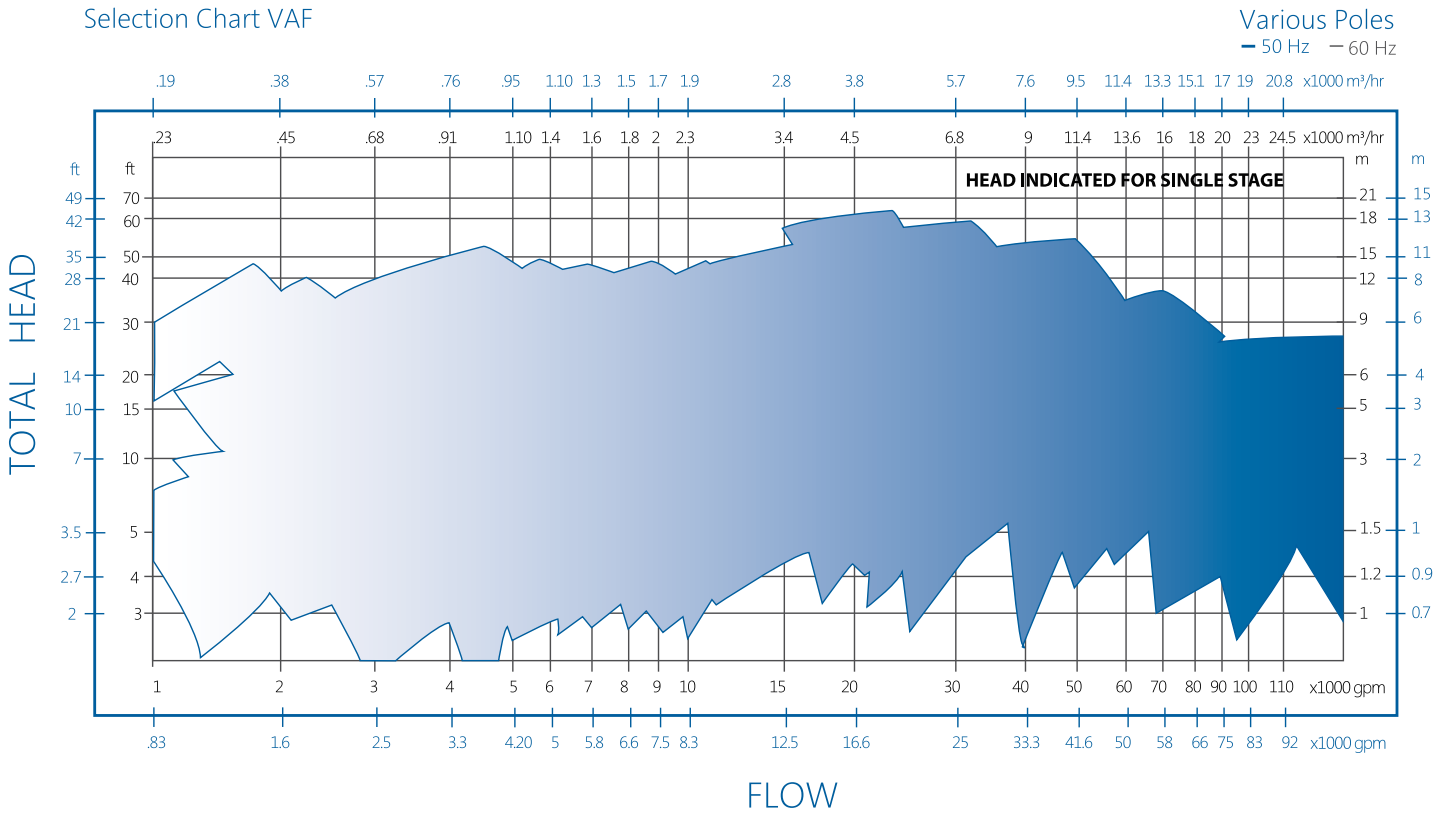
Note: For pump operations outside this range, please contact a Ruhrpumpen Representative.



1. Above or below base discharge.
2. Discharge elbows designed to reduce friction losses.
3. Diffusers designed to minimize turbulence and increase efficiency.
4. Product, oil, or fresh water lubrication.
5. Optional basket type strainer.
6. Optional umbrella to minimize vortices.
7. Cast iron bowls and bronze impeller are standard.
8. Carbon steel column with AISI-1045 shaft.
9. Fabricated steel discharge head.

Optional pull-out design for ease of maintenance.

Performance Range



To see more features of this pump, please see the VAF brochure, or contact a Ruhrpumpen representative.

VCT - Vertical Circulator and Mixed Flow Pumps

This pump can be used for water supply, waste treatment plants, condenser cooling, power generation, flood service, storm water disposal, industrial service, or sump drainage. Because of its mixed flow impeller, this pump handles large volumes of fluids with higher head than axial flow pumps.

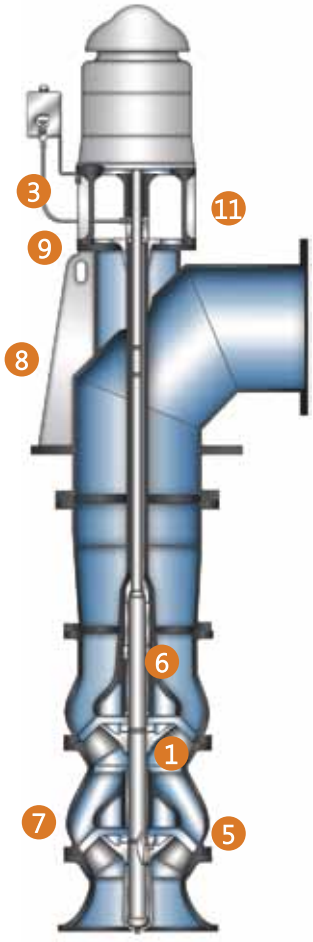
PRODUCT DESCRIPTION

- Single or multi-stage mixed flow, vertical centrifugal pump
- Semi-open impeller allows handling of large solids (closed impeller also available)
- Large bowl passages for better efficiency
- Threaded or flanged column (depending on size) with water or oil lubrication

PERFORMANCE DATA

Capacity	up to 400,000 US. gpm	90,850 m^3/h
Head	up to 575 feet	175 m
Pressure	up to 160 psi	11 bar
Temperature	-20 to 275 °F	-30 to 135 °C

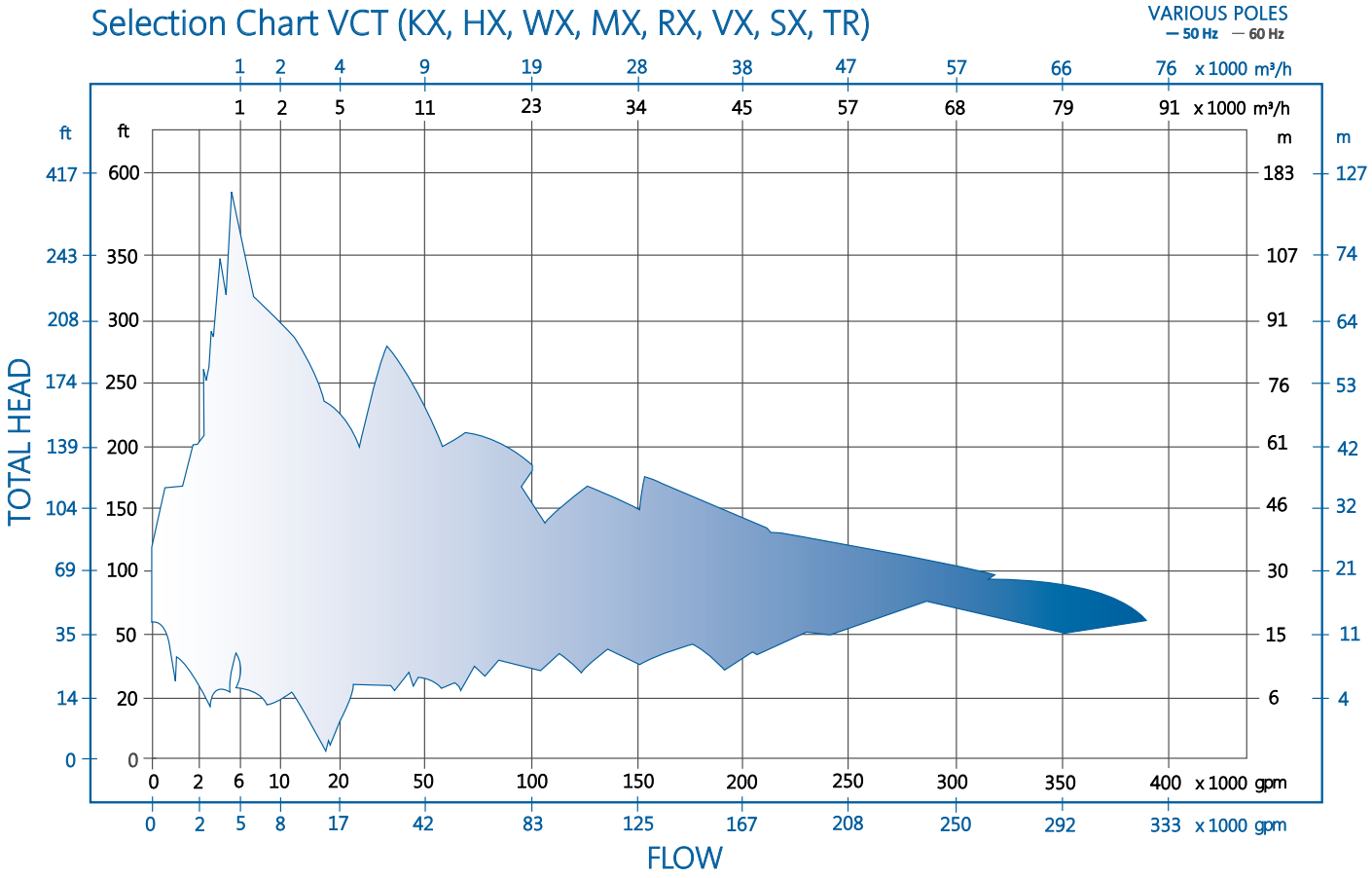
Note: For pump operations outside this range, please contact a Ruhrpumpen Representative.



1. With its mixed flow impeller, this pump handles large volumes of fluids with higher head than axial flow pumps.
2. Oil, fresh water, or self-lube column construction.
3. Wide range of impeller designs and specific speeds (1,800 – 14,000 US units) for optimum hydraulic coverage.
4. Integral bearing retainer.
5. Sizes 20 cm (8 in) to 305 cm (120 in).
6. Above or below ground discharge.
7. Packed stuffing box or mechanical seal.
8. Pump-mounted thrust bearings when required.
- Vertical space-saving construction.
- Engineered to customer specifications.
- Optional pull-out design for ease of maintenance.

Performance Range

Selection Chart VCT (KX, HX, WX, MX, RX, VX, SX, TR)



To see more features of this pump, please see the VCT brochure, or contact a Ruhrpumpen representative.

DSV – Heavy Duty, Vertical Process Pumps

The DSV pump, with low NPSH characteristics, is ideal for open sumps, channels, lakes, rivers, or other heavy siltladen applications. Without the limitation of a well casing, the larger waterways and twin volutes of the DSV provide lower liquid velocities. This also reduces abrasive wear and minimizes corrosion and erosion effects.

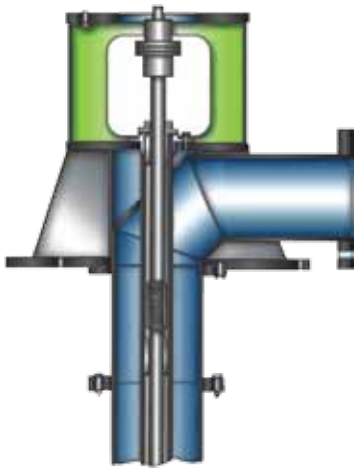
PRODUCT DESCRIPTION

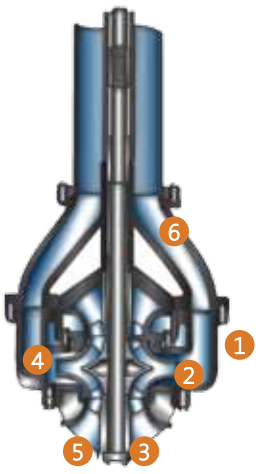
- Vertical space-saving construction
- Above or below base discharge
- Oil lubricated column, or force lubricated by the pumped liquid
- Packed stuffing box or mechanical seal
- Optional renewable impeller wear rings

PERFORMANCE DATA

Capacity	up to 80, 000 US. gpm	18,170 m^3/h
Head	up to 800 feet	243 m
Pressure	up to 280 psi	19 bar
Temperature	up to 302 °F	150 °C

Note: For pump operations outside this range, please contact a Ruhrpumpen Representative.





1 Volute Case – The twin volute case is designed to efficiently convert the velocity head created by the impeller into the pressure head. The volute case directs the liquid from the impeller into the transition diffuser with minimal of hydraulic loss.

2 Impeller – The enclosed, double-suction centrifugal impeller is keyed to the shaft and held in position by corrosion-resistant retaining rings. The retaining rings are protected from abrasion by collars that turn with the impeller.

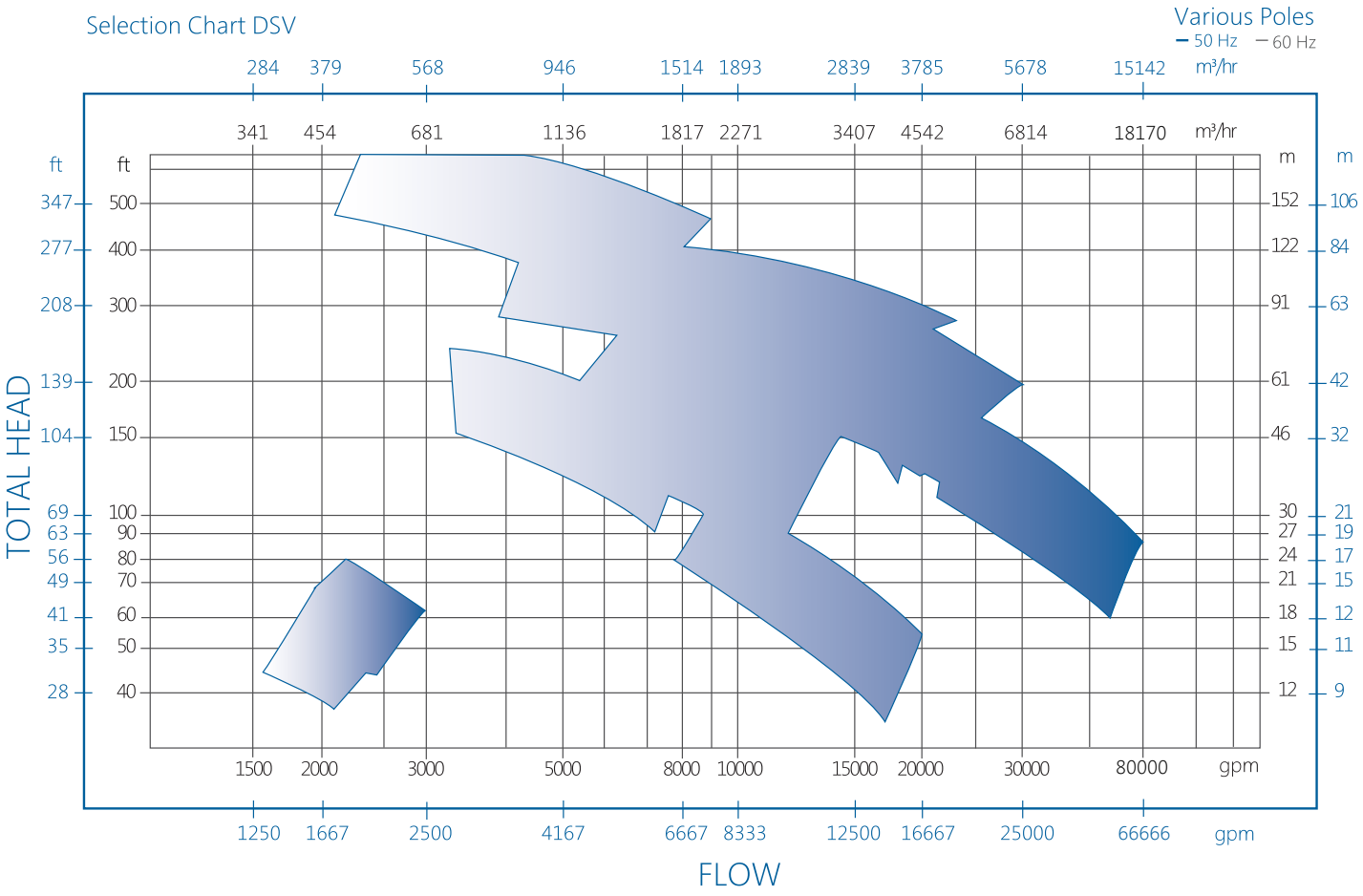
3 Suction Bell – The upper and lower flared suction bell directs the liquid into the impeller. It contains four guide vanes to prevent vortexing and to provide the housing for the suction bell bearings.

4 Casing Wear Rings – These are provided in the suction bell on both sides of the impeller. The wear rings are closely fitted to minimize the return of liquid from the discharge side of the impeller past the skirt to the suction side due to the pressure differential.

5 Bell Bearings – These are located in the suction bell, immediately adjacent to either side of the impeller. The bell bearings are a sleeve-type and grooved for proper lubrication, and closely fitted to maintain alignment.

6 Transition Diffuser – This provides a smooth hydraulic flow from the volute to the column pipe. The transition diffuser contains the connector bearing that couples to the bottom section of the shaft tube. Flanged connections with registered fits are provided for bolting the column pipe.

Performance Range



To see more features of this pump, please see the DSV brochure, or contact a Ruhrpumpen representative.

VLT – Vertical Process Pump

The VLT is a heavy duty vertical process pump of the "double casing" type (as defined by API-610) and is also designed for high specification requirements often found in the Municipal Water Market. With multi-staging in the medium specific speed design range, the VLT provides outstanding efficiencies and low cost operation in high head applications. The special first stage allows operation with extremely low NPSH requirements while running at optimum speeds. Most VLT pumps are shipped completely assembled (less driver and suction barrel), therefore the field installation is simplified.

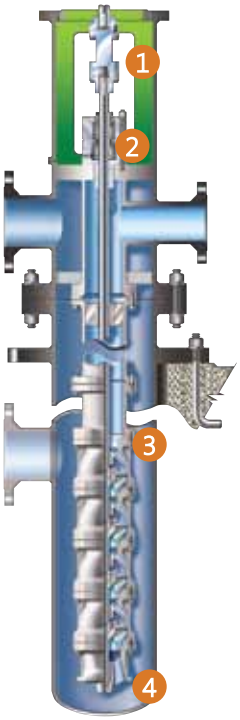
PRODUCT DESCRIPTION

- Low NPSH "Shockless Entry" first stage impeller
- Integral fabricated column support bearings
- Collet, ring or keyed impeller mounting
- One-piece shaft construction for shaft lengths to 20ft (6m)
- Rigid four-piece coupling
- Fabrications manufactured using ASME Section IX code qualified welders for API applications
- Wide range of hydraulic designs to suit all applications
- Pump mounted thrust bearing when required
- Tank or sump mount options available

PERFORMANCE DATA

Capacity	up to 7,000 US. gpm	1,600 m^3/h
Head	up to 4,900 feet	1,500 m
Pressure	up to 2,020 psi	140 bar
Temperature	-302 to 1,050 °F	-196 to 565 °C
Horsepower	1,500 HP	1,200 kW

Note: For pump operations outside this range, please contact a Ruhrpumpen Representative.



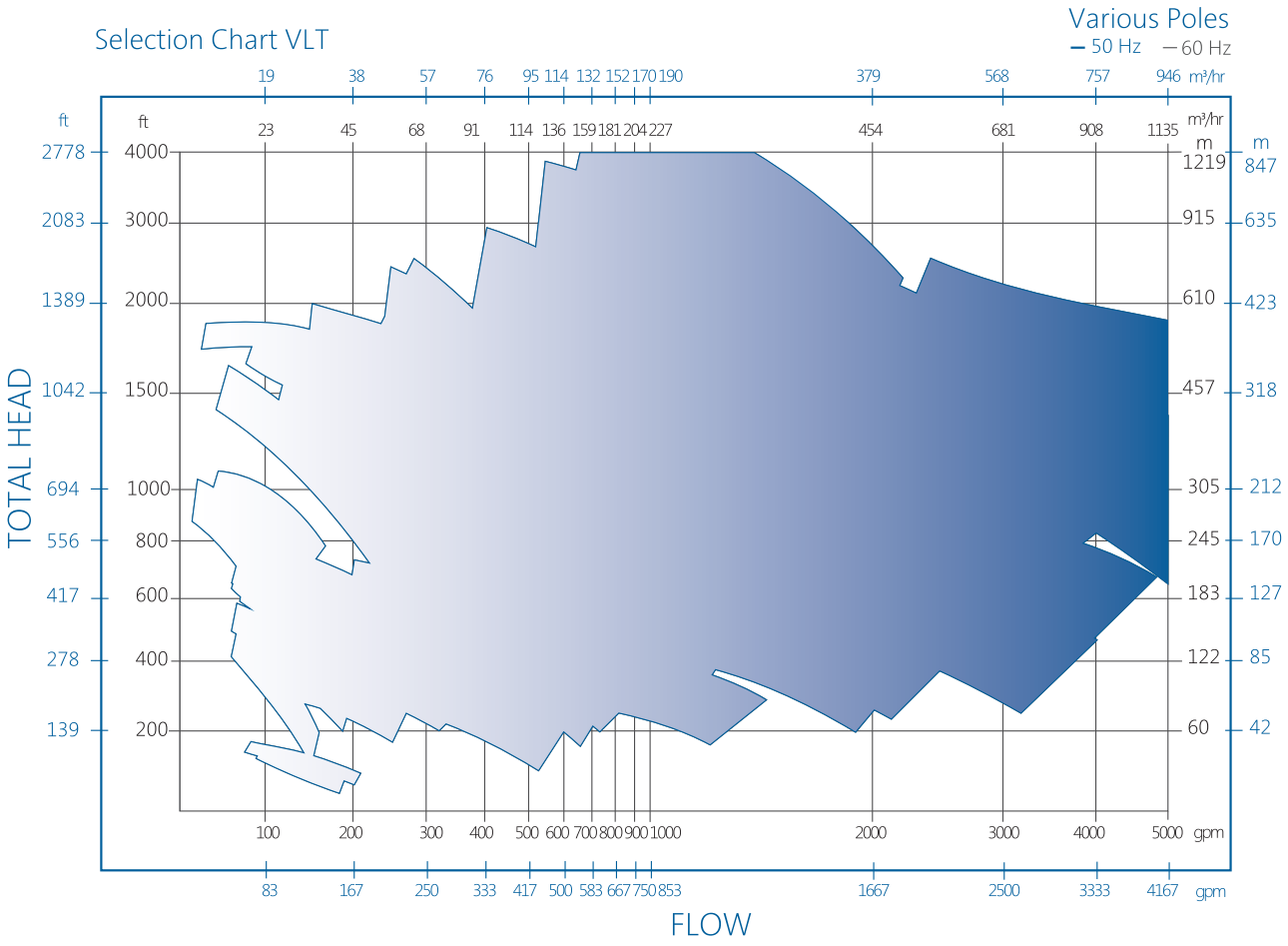
1 The head is fitted with an all steel rigid 4 piece pump to motor coupling. It has a spacer which can be removed without disturbing the motor or pump connections. The spacer is long enough to allow replacement of the mechanical seal as a single cartridge.

2 The mechanical seal is located in full flow of discharge for positive lubrication-cooling and is inherently self-venting and self-cleaning. Water jacketed, bleed-off stuffing boxes are also available.

3 The O-ring gaskets throughout allow metal-to-metal rabbeted fits between all components, wich prevents possible leaking.

4 Graphite-babbeted alloy bearings are standard throughout.

Performance Range



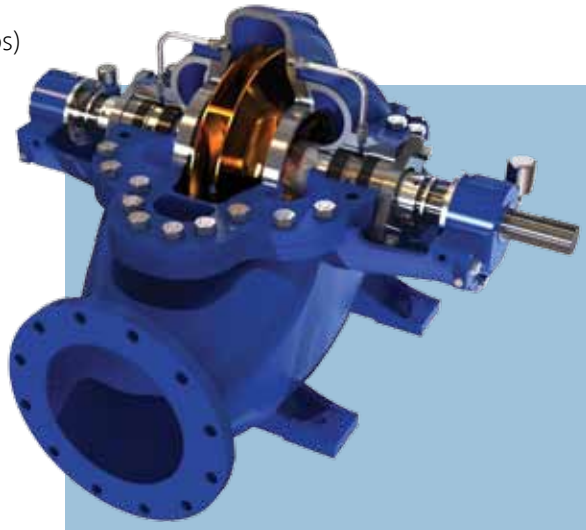
To see more features of this pump, please see the VLT brochure, or contact a Ruhrpumpen representative.

HSC / HSD / HSR / ZW – Split Case Pumps

Horizontal, single stage, double suction, double volute axially split case centrifugal pump product line. Suction and discharge nozzles are integrally cast in the lower half of the casing and on the same horizontal centerline. The nozzle configuration is side/side. This pump is designed for high specification requirements often found in the Municipal Water Market, dewatering or water applications in general.

PRODUCT DESCRIPTION

- Single stage horizontal centrifugal pump
- Horizontally split casing, double volute (HSC pumps and some HSR pumps) minimizes thrust loads and accommodates a wide range of capacities
- Flanged connections
- Enclosed impellers, double suction provides hydraulic balance eliminating axial thrust
- Clockwise or counter clockwise rotation
- Double ended shaft available
- Oil or grease lubricated bearings
- Stuffing box configured for packing or mechanical seals
- Horizontal or vertical mounting configuration
- Renewable wear rings

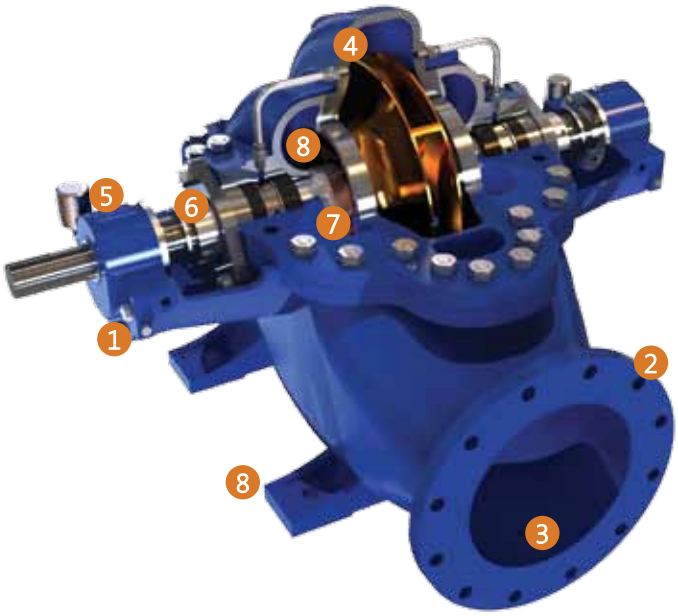


HS/ZW

PERFORMANCE DATA

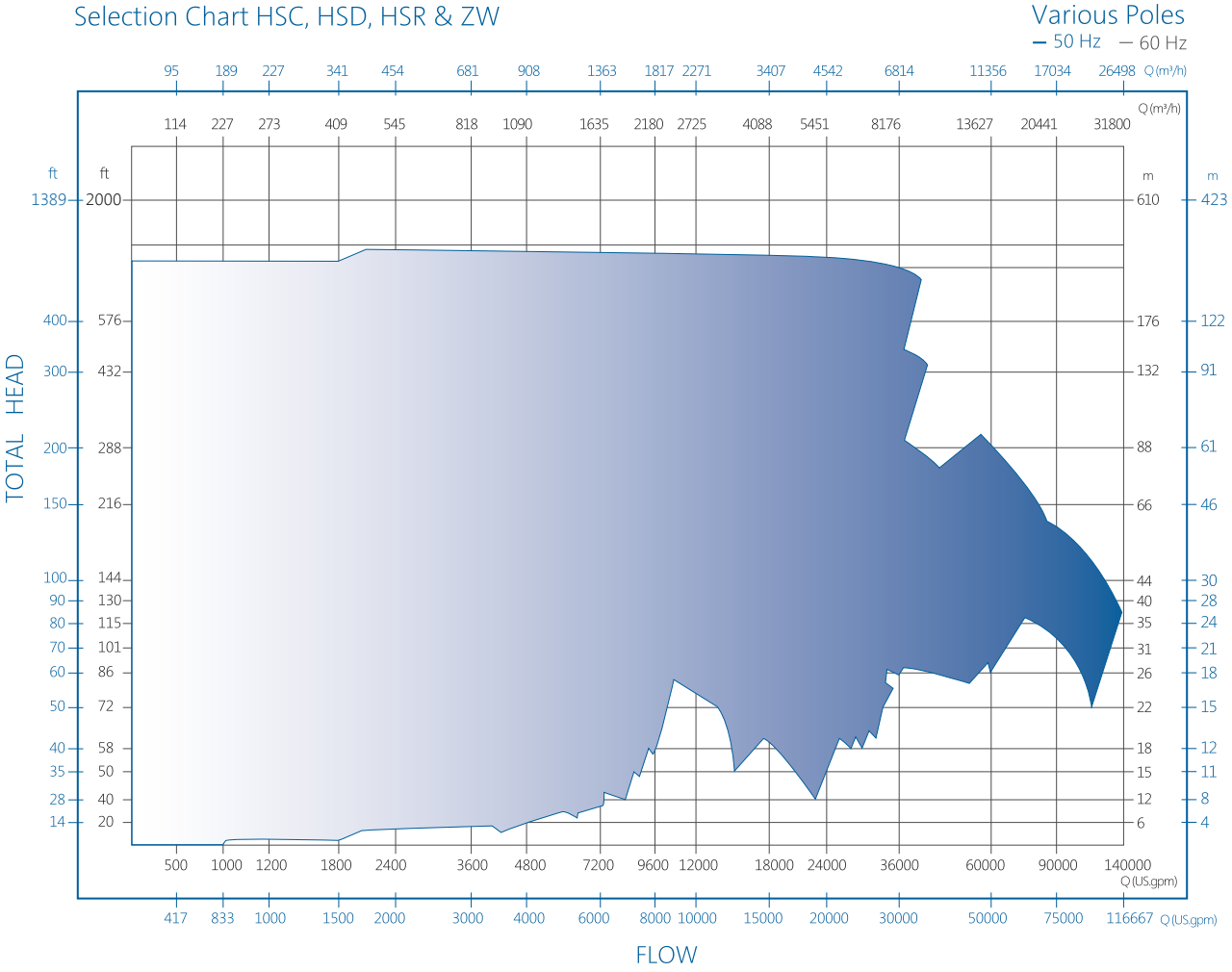
Capacity	up to 140,000 U.S. gpm	31,800 m³/h
Head	up to 1,575 feet	480 m
Pressure	up to 298 psi	20 bar
Temperature	50 to 500 °F	10 to 270 °C

Note: For pump operations outside this range, please contact a Ruhrpumpen Representative.



1. Bearing brackets are integrally cast with the casing, assuring perfect alignment.
2. All suction and discharge connections on the same center line to accommodate piping.
3. Smaller discharge diameter.
4. Dynamically balanced impellers for vibration-free operation.
5. Interchangeable line and thrust bearings.
6. A rigid shaft in combination with double volute casing results in low shaft deflection at all operating points.
7. Shaft sleeve is keyed to shaft and held in place by separate shaft nut (HSR and HSC).
8. Casing wear rings are renewable. Stuffing box optional.
9. Many sizes available with bottom suction for installation flexibility.

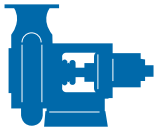
Performance Range



To see more features of this pump, please see the Split Case brochure, or contact a Ruhrpumpen representative.

Additional Pumps for the Municipal Market

SHD — Solid Handling Pumps



Characteristics
- Single stage
- Horizontal or Vertical
- Enclosed impellers
- End suction single volute casing
- Grease lubricated

Fluids
Water
Wastewater
River water
Rainwater

Performance Range

US Units	Metric Units
Q: up to 10,000 gpm	Q: 2,271 m³/h
H: up to 240 ft	H: 73 m
T: up to 248 °F	T: 120 °C
Pd: up to 150 psi	Pd: 10.3 bar

ST / STV — Horizontal or Vertical Centrifugal Pumps with Two-Channel Non-clog (Pot) Impeller

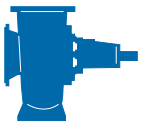
Characteristics
- Horizontal or Vertical, single suction
- Single stage, two-channel pot Impeller
- Radially split casing, bearing bracket
- Discharge branch tangentially

Fluids
Wastewater
Fecal matter
Rainwater
Sludge

Performance Range

US Units	Metric Units
Q: 1,750 to 35,233 gpm	Q: 400 to 8,000 m³/h
H: 11 to 115 ft	H: 3.5 to 32 m
T: up to 176 °F	T: 80 °C
Solid size: 4.92 to 11.81 in	Solid size: 125 to 300 mm

SKO — Horizontal Centrifugal Pumps with Three-Channel Non-clog (Pot) Impeller



Characteristics
- Horizontal or Vertical, single suction
- Single stage, radially split casing
- Three-Channel Impeller
- Discharge branch tangentially

Fluids
Wastewater
Fecal Matter
Rainwater
Sludge

Performance Range

US Units	Metric Units
Q: 1,100 to 13,220 gpm	Q: 250 to 3,000 m³/h
H: 6 to 131 ft	H: 2 to 20 m
T: up to 140 °F	T: 60 °C
Solid size: 2.95 to 7 in	Solid size: 75 to 180mm

SK / SKV — Horizontal or Vertical Centrifugal Pumps with Three-Channel Non-clog (Pot) Impeller

Characteristics
- Horizontal or Vertical
- Single stage
- Three-Channel impeller
- Back Pull-out Design

Fluids
Combined sewage
Rainwater
Raw wastewater

Performance Range

US Units	Metric Units
Q: up to 70,000 gpm	Q: 15,900 m³/h
H: up to 164 ft	H: 50 m
T: up to 104 °F	T: 40 °C
Pd: up to 64 psi	Pd: 4.4 bar

LKT — Submersible Mixed Flow Pumps

Characteristics
- Vertical
- Single suction
- Single stage
- Submersible motor

Fluids
Water
Rainwater
River water
Cooling water

Performance Range

US Units	Metric Units
Q: up to 10,000 gpm	Q: 2,270 m³/h
H: up to 65 ft	H: 20 m
T: up to 104 °F	T: 40 °C

VLT (Diffuser) — Canister-Type Pumps

Characteristics
- Vertical, single suction
- Single stage, two stage
- Multi-stage, nozzles inline

Fluids
Hydrocarbons, lyes
Chemical solutions, Water,
Seawater, Condensate,
Cryogenic liquids

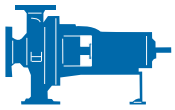
Performance Range

US Units	Metric Units
Q: up to 2,420 gpm	Q: 550 m³/h
H: up to 4,900 ft	H: 1,500 m
T: -292 to 520 °F	T: -180 to 270 °C
Pd: up to 2,020 psi	Pd: 140 bar

Additional Pumps for the Municipal Market

CPP-21

Volute Casing Centrifugal Pumps



Characteristics
- Single Stage
- ANSI B73.1, Horizontal
- Single suction, single stage bearing bracket

Fluids
Chemical solutions
Water, Hydrocarbons
Service Water

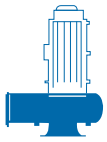
Performance Range

US Units:
Q: up to 5,000 gpm
H: up to 776 ft
T: up to 600 °F

Metric Units:
Q: 1,150 m³/h
H: 235 m
T: 315 °C

STT

Submersible Volute Casing Centrifugal Pumps



Characteristics
- Vertical
- Single suction
- Single stage
- Submersible motor

Fluids
Water
Rainwater
Combined sewage
Sludge

Performance Range

US Units:
Q: 1,175 to 37,500 gpm
H: 11.5 to 130 ft
T: 14 to 104 °F
Pd: up to 100 psi

Metric Units:
Q: 400 to 8,500 m³/h
H: 3.5 to 40 m
T: -10 to 40 °C
Pd: 7 bar

PVT

Submersible Propeller Pumps

Characteristics
- Vertical
- Single suction
- Single stage
- Submersible motor

Fluids
Water, Rainwater
River water
Seawater
Cooling water

Performance Range

US Units:
Q: 1,320 to 80,000 gpm
H: up to 50 ft
T: up to 104 °F
Pd: up to 100 psi

Metric Units:
Q: 3,000 to 18,000 m³/h
H: 15 m
T: 40 °C
Pd: 7 bar

ZM

Volute Casing Centrifugal Pumps

Characteristics
- Axially split
- Horizontal single or double stage
- Double volute casing
- Enclosed impellers

Fluids
Water
Drinking water
River water
Petrochemical

Performance Range

US Units:
Q: 440 to 96,863 gpm
H: 30 to 3900 ft
T: -4 to 401 °F
Pd: up to 2,103 psi

Metric Units:
Q: 100 to 22,000m³/h
H: 10 to 1200m
T: -20 to 205 °C
Pd: 145 bar

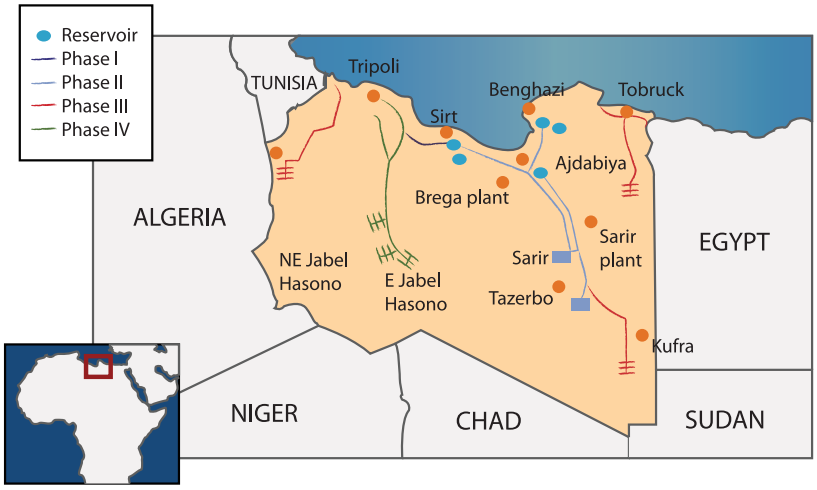
The Ruhrpumpen product range is not limited to the pumps mentioned in this brochure. If you are interested in other pumps for water, or any other applications, please contact us at info@ruhrpumpen.com or visit us online at: www.ruhrpumpen.com

Reference Project
THE GREAT MAN-MADE RIVER

The Great Man-Made River is a network of pipes that supplies water from the Sahara Desert in Libya to the Nubian Sandstone Aquifer System. The Guinness World Records 2008 book has acknowledged this as the world's largest irrigation project.

It is the largest underground network of pipes and aqueducts in the world. It consists of more than 1,300 wells, most of them more than 500m deep, and supplies 6,500,000 m³/d of fresh water to the cities of Tripoli, Benghazi, Sirt, and elsewhere.

The project's construction was divided into five logically separated phases. The first phase required 85 million m³ of excavation and was inaugurated on August 28, 1991.



Ruhrpumpen supplied pumps for Phase II Jabel Hasono to Tripoli and also for Phase IV Ghardames to Tripoli 91.

Order Number	Customer	Year	Qty	Pump Type	Q (m³/h)	H (m)	N (rpm)	Temp (C°)	Density (kg/dm³)	Fluid
283177	DONG AH CONST. Houslow NEJH (S) GMR Lybia	1998	5	ZM III 630/08	4,482	72	990	25		Drinking Water
283176	DONG AH CONST. Houslow NEJH (S) GMR Lybia	1999	10	ZM III 630/08	7,434	79	990	25		Drinking Water
283178	DONG AH CONST. Houslow NEJH (S) GMR Lybia	1998	5	ZM III 750/08	4,482	101	990	25		Drinking Water
283225	DONG AH CONST. Großbritannien TARHUANAH GMR. Lybia	2000	8	ZM III 630/08	5,544	56	990	35	1,000	Drinking Water
283592	AL Nahr CO. Ltd Ghadames Libyia	2009	6	ZM III 750/06	2,592	157	1,480	40	1,000	Drinking Water
283595	AL Nahr CO. Ltd Ghadames Libyia	2009	6	ZM III 750/06	2,592	153	1,480	40	1,000	Drinking Water
283596	AL Nahr CO. Ltd Ghadames Libyia	2009	6	ZM III 750/06	2,592	163	1,480	40	1,000	Drinking Water

Reference Project
CAWELO WATER DISTRICT

Cawelo Water District, a private company established in 1965, located near Bakersfield, California. They provide fresh water to a wide range of customers for irrigation and other purposes in rural areas of Kern County.

Ruhrpumpen supplied 6 water pumps for the Cawelo Water District in 2007 with the following characteristics:

Unit. nr	Qty	Size	Pump Type	Fluid	No. Stg	Customer	Temp (°F)	Capacity (US gpm)	TDH (feet)	Speed	Driver (bhp)
200411	3	30D-1560	VTP	WATER	3	CAWELO WATER DISTRICT	68	11,671	227	900	1000.0
200412	2	24C-730	VTP	WATER	1	CAWELO WATER DISTRICT	68	7,182	80	1200	200.0
200413	1	26KXHL	VCT	WATER	2	CAWELO WATER DISTRICT	68	7,182	227	1200	500.0

Water and Wastewater Market

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Barge Vertical Pump

Multi-stage, pollution prevention design, semi-open impellers, primary self-priming 1st stage impeller, air relief and separation chamber.
Ballast Operation, Transfer of Gasoline, Fuel Oils, Light Lubricants, Heavy oils and Barge stripping / dewatering.

Sump Pump

Vertical arrangement, single suction, single stage.
Water, Hydrocarbons, Chemical Solutions.

Multi-stage Axially Split Casing Pump

Horizontal, multi-stage, twin volute casing, radial, closed single or double suction impeller, near-centerline mounted. API pump Type BB3.
Oil Fields, Crude Oil and Oil Pipelines, Water Pipelines, Fluid Injection, Power Plants, High Pressure Services.

Fire Pump

Horizontal split case, listed by Underwriters Laboratories Inc. and approved by Factory Mutual.
Commercial Centers, High Rise Buildings, Onshore / Offshore Platforms, Power Stations and Chemical Industries.

With every project you can count on QUALITY, SERVICE, EXPERTISE, INNOVATION and COMPETITIVENESS.
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