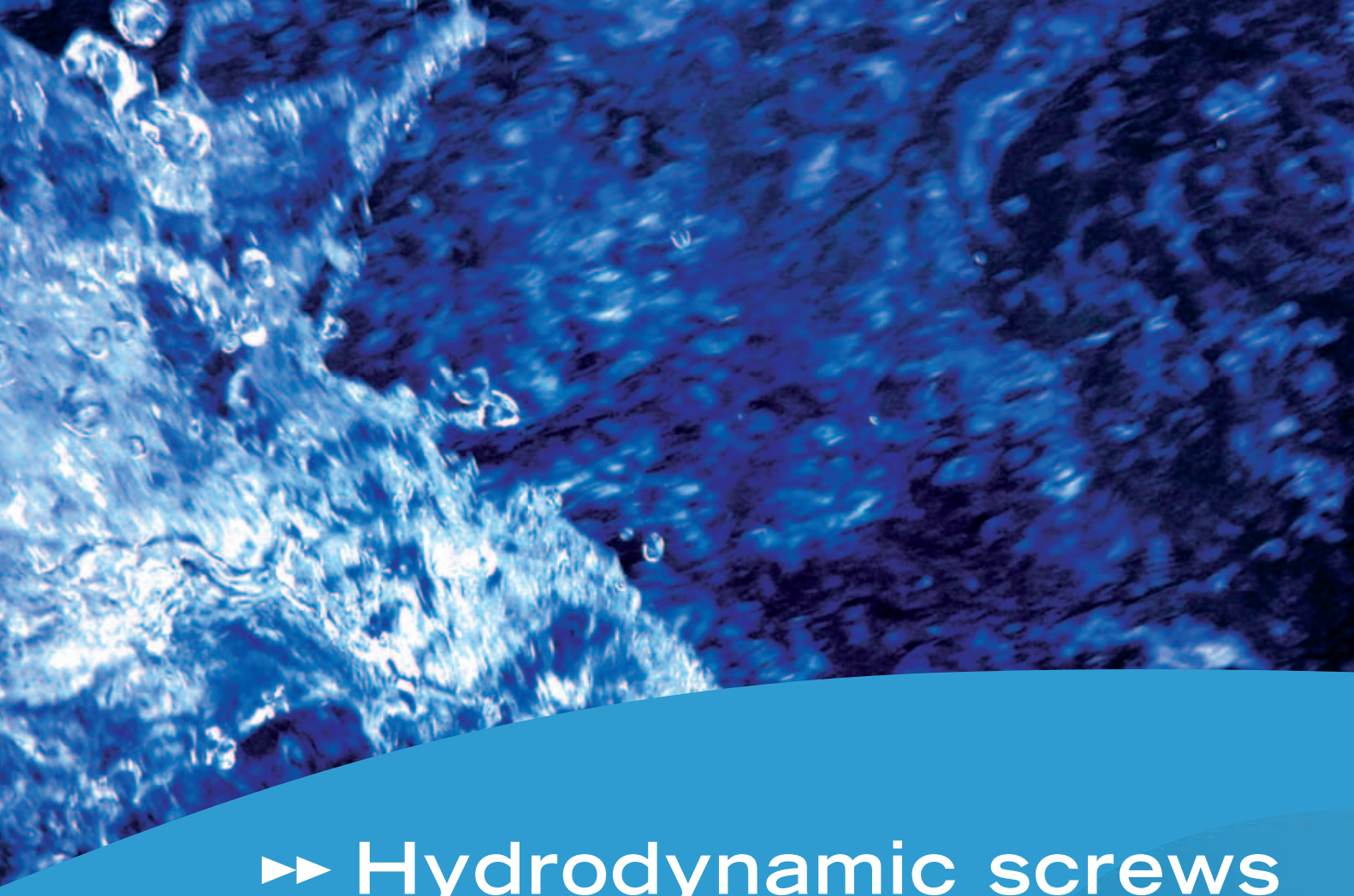
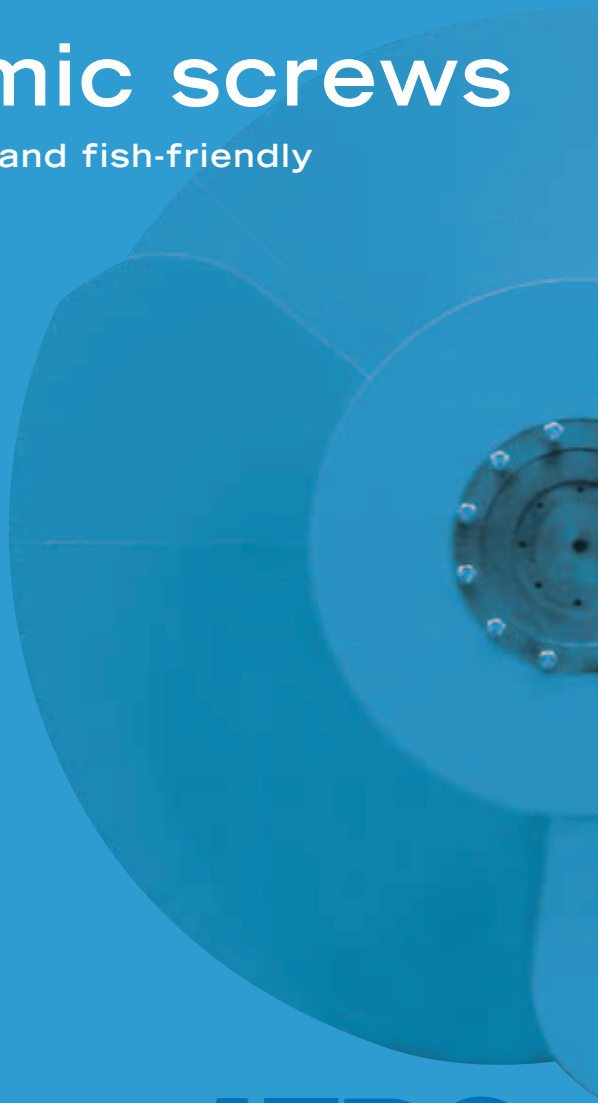


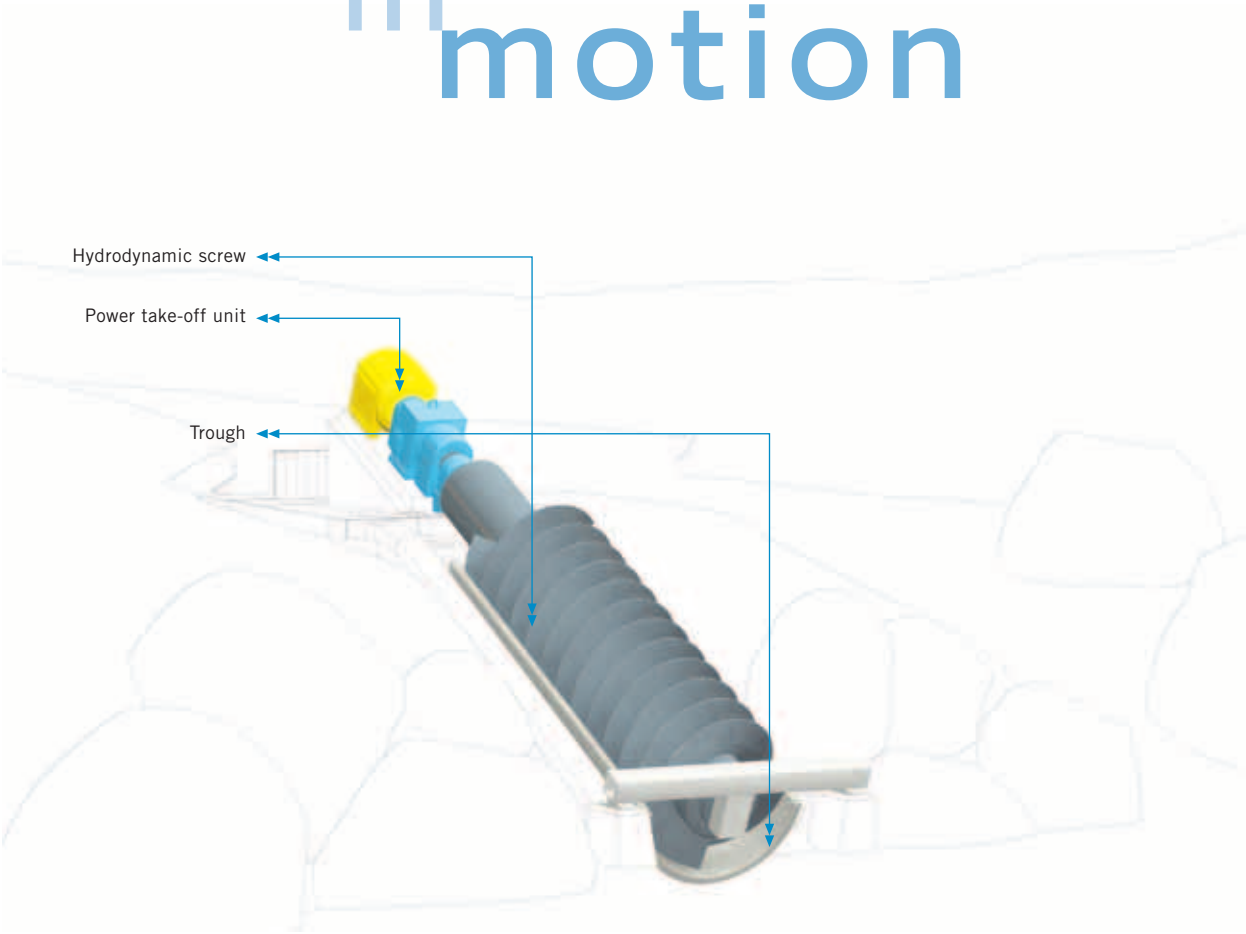
►► Hydrodynamic screws

Energy extraction – efficient and fish-friendly



RITZ ATRO

Water in motion



►► The new type of energy generation

In the form of the Archimedean screw, the water extraction screw has been known since ancient times. What is new is the patented application, which by an inversion of the energy flow in its operation, turns the Archimedes' screw trough pump into a power generator for the extraction of energy.

A water power generating facility makes use of the energy difference between two different levels of flowing water by transferring the water from natural bed of the stream at the higher level to the bed at the lower level and effectively extracting its potential energy, which is then made available at the rotor shaft for further use.

Time and cost optimised

Ritz-Atro's compact solution

The constructional effort required for a hydrodynamic screw is small compared to that required for a turbine. If the compact version of a hydrodynamic screw (hydrodynamic screw + trough + power take-off unit combined as a single unit) is used, the constructional effort can be further reduced. The whole system is delivered as an integrated whole. You save valuable time, which you would otherwise spend during the careful matching up of the individual construction components.

We are happy to provide advice as to which hydrodynamic screw is most sensible for you. Give us a call and agree upon a non-binding on-site appointment!

Examples of use

- Replacement for small turbine units which require reconditioning
- Replacement for defective water-wheels
- Clean water outlet of sewage treatment plants
- Residual water screw for installation into existing channel or weir
- Production of low-level hydrodynamic power in former irrigation weirs

You can, of course, decide in favour of a conventionally designed hydrodynamic screw in the aforementioned areas of application rather than a compact worm.

The advantages at a glance

- **No control system – the screw matches itself automatically to the supply frequency and the water supply**
- **The efficiency is greater than with comparable waterwheels and small turbines**
- **Flat, stable efficiency gradient**
- **Robust, long wearing, trouble free**
- **No cleaning, little maintenance**
- **No fine screens necessary**
- **Little underground digging required in comparison to turbines**
- **Very friendly to fish**

Why use a hydrodynamic screw?

Fossil fuels can be saved by means of the environmentally-friendly use of this source of energy. In this process the hydrodynamic screw can be ideally inserted into the environment – without having a disruptive effect.

Varying water heads and varying water flow rates upstream and downstream of the screw only marginally affect the efficiency and have no effect on the function or operation of the hydrodynamic screw.
With hydrodynamic screws, even minimum hydrodynamic potentials at powers from 1 kW can be made use of economically.

With hydrodynamic screws, fine screening installations for protecting against floating objects and fishes, needed for turbines, can be done without: The parts washed up and fish can pass through the screw unhindered and unharmed.

Energy losses due to a decrease in the height of fall or flow losses are thus avoided.
Due to the large jaw settings of the upstream coarse screens the rakings' quantities that are incurred – and thus the waste disposal costs – are greatly reduced.

Small hydrodynamic facilities hide an immense potential for extracting natural energy from water power.
Another positive aspect is that the water becomes enriched with oxygen, which in turn improves the quality of the water downstream.

The advantages for fish

Fishery biological assessment (extract)

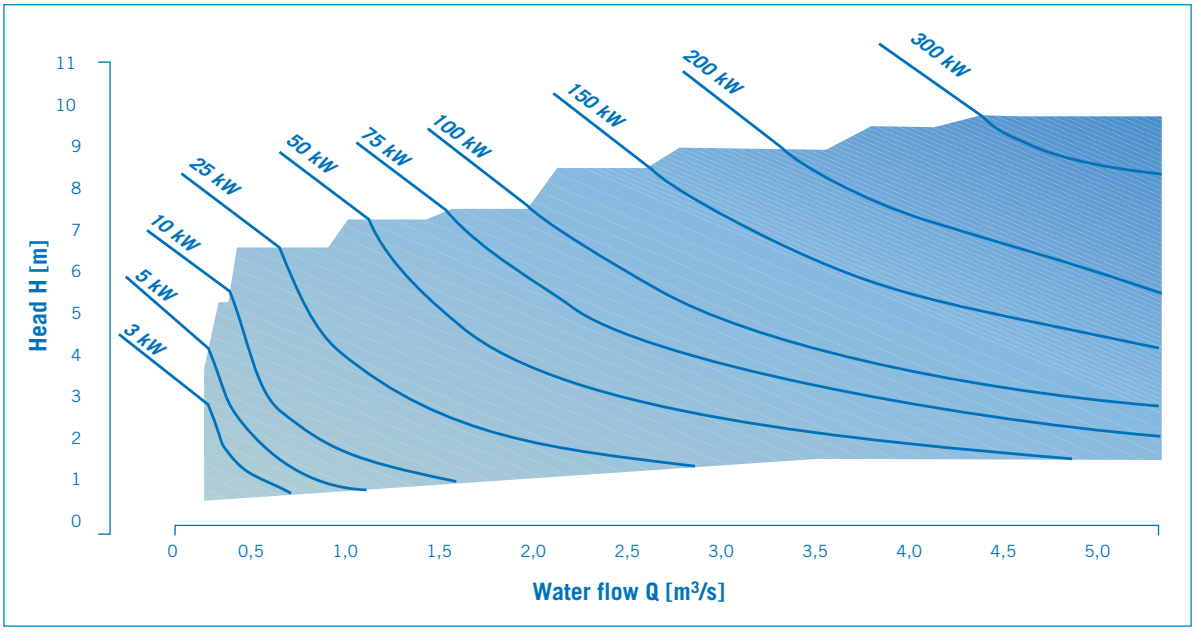
Ritz-Atro has commissioned a survey with an independent expert in order to investigate the fish friendliness of its patented hydrodynamic worm. Here are some extracts:

Water banking and turbine installations are not only a major obsticle and potential hazard for fishes travelling upstream but also for fishes travelling downstream. Water power generation of any type is an obstacle for the spawning migration of migratory fishes. In many flowing waterways this affects the European eel because eels are considerably affected by Kaplan turbines and Francis turbines. But grey trout, salmon or river lamprey are also at risk. [...]

The length distribution for the various species show that both small fishes (larger than 8 cm) and large specimens (up to 58 cm) can pass through the hydrodynamic screw without harm. Even relatively small and weak fish such as gudgeon or the miller's thumb have been able to pass through the hydrodynamic screw without injury. [...]

The overall result is that the hydrodynamic screw is very friendly to fishes and highly suitable for fish migration. According to present knowledge, the fishes suffer, if at all, only minor injury in form of damaged scales and bruising.

Electric power provided to terminals
(Generator Power)

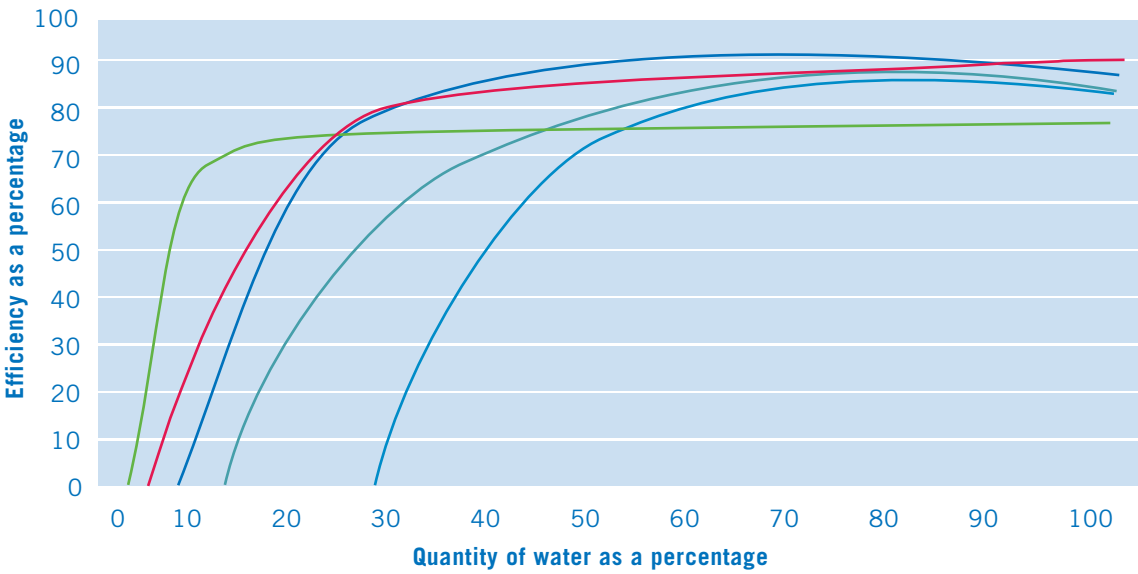


Technical details

Water flow	**up to 5500 l/s**	**Efficiency**	**up to 90%**
Head	**up to 10 m**	**Power**	**up to 300 kW**

Efficiency of the hydrodynamic screw

Expert report by the Kaiserslautern University of Applied Science to determine the efficieny



Hydrodynamic screw
Overshot waterwheel
Kaplan water turbine doubly regulated
Francis turbine nq = 37
Francis turbine nq = 75

By way of a summary the results of measurement carried out are as follows:

The efficiency of the hydrodynamic worm is similar or higher than that of other small water power stations of this type (turbines, water wheels).
However the high partial load efficiency, which even still makes it possible to efficiently use the hydraulic energy that is available even in the event of a low inflow volume. This is only possible with great difficulty in plants of similar sizes.

Worm efficiency under full load: (near design point)	84,25%
Maximum absolute error:	± 4,21%
Average absolute error:	± 1,98%
Worm efficiency under partial load: (approx. 40% of the hydraulic design capacity)	79,13%
Maximum absolute error:	± 4,98%
Average absolute error:	± 2,55%

These values are determined at our "Mühlen in Taufers" plant and apply for the following sizes:

Nominal water quantity	1420 l/s
Height of fall	2,11 m
Diameter of the hydrodynamic screw	2 m
Number of revolutions	42,7 min^{-1}

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Ritz-Atro, founded in 1969, is now one of the most significant companies in the area of effluent treatment and environmental protection – and indeed throughout the world. Innovative drive and pioneering spirit characterised the company from the very beginning.

Ritz-Atro sees itself as its customer's partner. Right from the phase of the initial planning the customer is supported by well qualified staff, who guarantee the secure and economic realisation of the construction project.

Ritz-Atro takes all conceivable measures to constantly further improve the high standard of quality of its products. A quality management system certified in accordance with DIN EN ISO 9001 is thus an important component part of the company philosophy.

Ritz-Atro Pumpwerksbau GmbH
Max-Brod-Straße 2
90471 Nürnberg
Germany

Telefon + 49 (0) 911 998 12 - 0
Telefax + 49 (0) 911 813 76 46
eMail sales@ritz-atro.de
www.ritz-atro.de