

# LINGENHÖLE TECHNOLOGIE

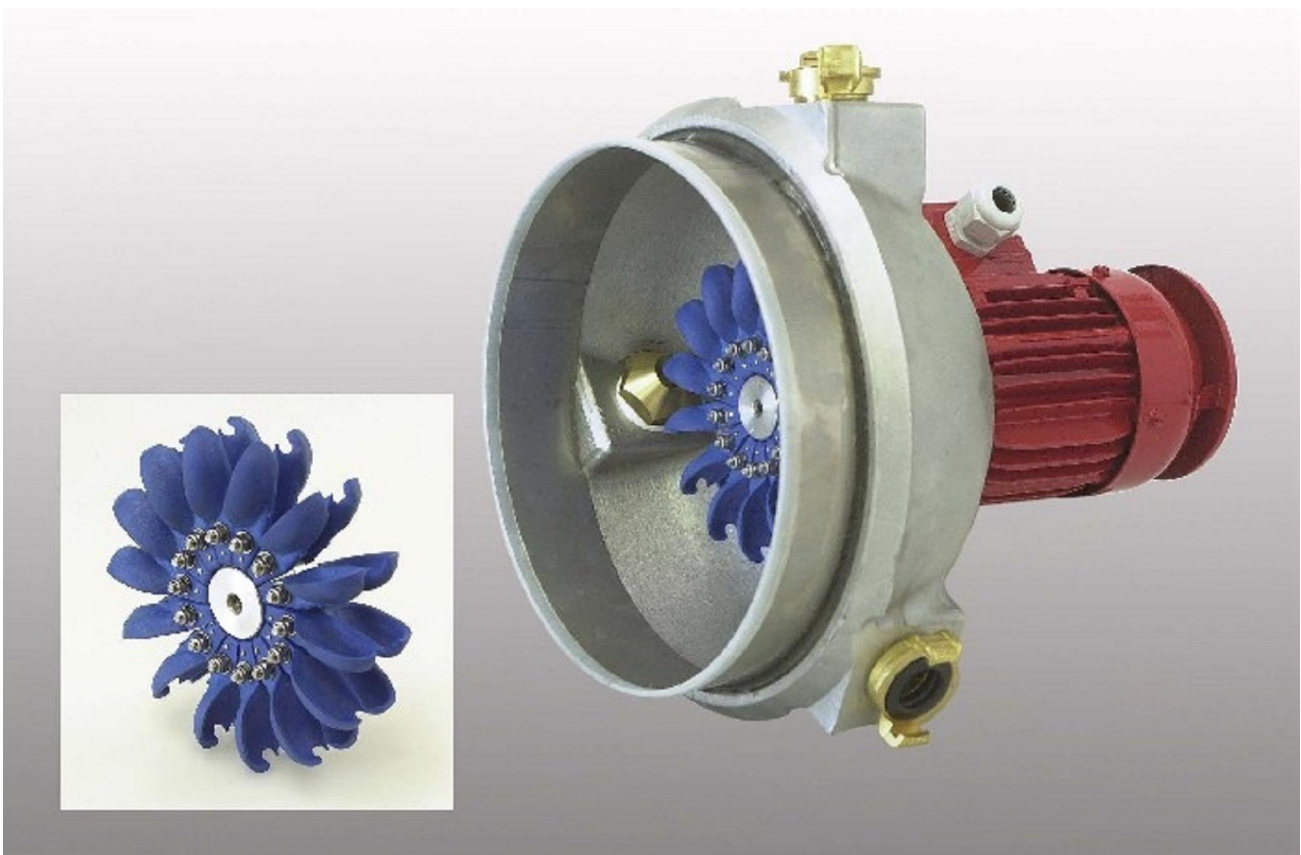
*Center for heat treatment*

*Mechanical Components*

*Hydropower plants - Turbine manufacturing*

**Instructions for use (V 1.0)**

**Pico- Hydro Power Plant KT100/ KT340/ KT1100**







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## Important Information in Advance

Installation and commissioning of all parts and components described in this document have to be carried out by adequately trained professionals (e.g. electrician). Lingenhölle will not be responsible or liable for any damages caused by installation or commissioning by unqualified people!

Security advice in these instructions is given by pictograms. Pictograms point at type and intensity of the danger.

Applied pictograms	Signal words	Meaning
Warning of Electric Voltage 	Danger	Warning of imminent danger. <b>Consequences of disregard:            Death or severest injuries</b>
Warning of a General Danger 	Warning Caution	1. Warning of the possibility of a very dangerous situation. <b>Possible consequences of disregard:            Death or severest injuries</b> 2. Warning of the possibility of a dangerous situation <b>Possible consequences of disregard:            Injuries</b>
Warning of Material Damage 	STOP!	Warning of possible material damage <b>Possible consequences of disregard:            Damage of the system or its environment</b>
Information 	Hint!	Identifies a useful hint. <b>This hint facilitates the handling of the system or appliance.</b>

## **Legal Provisions**

### **General**

This document is the latest version of the instruction manual. Its contents cannot be the reason for any claim regarding previously supplied Pico Hydro Power Plants.

### **Intended Use**

The system as described in this document must only be used for the intended purpose and under the circumstances as ordered and confirmed. Any operation beyond the confirmed capacity limits is not allowed and will make any guarantee void immediately.

The use under different operating conditions than as intended has to be confirmed by the supplier.

### **Guarantee**

Any guarantee claims have to be filed in writing immediately after notice of the defect or fault with Lingenhölle Technologie GmbH. Further details regarding guarantee can be found in the general conditions of sale and delivery of Lingenhölle Technologie GmbH.

### **Transport Damage**

All parts and components are shipped in proper condition. Upon receipt the condition of the parts and components must be checked immediately. In case of any damage found buyer must report this immediately to the shipping company and notify Lingenhölle. Depending on the grade of damage the system must not be installed. Lingenhölle has to approve the use of the system in writing.

## **Security Advice**

### **General**

- The security advice in this document is not exhaustive. In case of any questions please contact Lingenhölle Technologie GmbH
- At the time of delivery the systems correspond to the latest state of the art and are completely reliable in operation.
- In case Lingenhölle has made the calculation of the turbine design the following is applicable:
  - a) The design always is based on the hydraulic data provided by the customer.
  - b) The customer will receive the results of the calculation including all necessary details after clarification of all issues, latest with the confirmation of his order.
  - c) In case the basic data are changed during construction of the project, the results of the calculation become null and void. In this case Lingenhölle Technologie will not be responsible for a safe operation of the system.
- The system has to be operated in perfect condition. In case of disturbances or increasing operation temperature the system has to be shut down immediately.
- Any modification or change of the system is forbidden and will void the guarantee.



Prior to any works at the turbine the system has to be shut down, at zero rpm, and the water input has to be closed completely. For the duration of the works it has to be ensured that the system cannot be set into operation again by a third party.



The Pico Hydro Power Plant must not be used as earth connection for welding.



Increased surface temperatures may occur under certain circumstances (e.g. overcharge of the turbine). **CAUTION! RISK OF BURNS!**



Although a 24 Volt system is used, it is possible for extremely dangerous voltage to occur causing damage to people and material. This can happen when the generator is run without load and at higher than nominal speed. The voltage of the generator is depending on the head and varies according to the charge of the generator.



For installation, parametrisation and operation of the system, the relevant information of the manufacturer and directions for single components and the applicable electric regulations must be taken into consideration and to be followed.



**CAUTION:** Battery systems can provide at short notice large amounts of energy. In case of faults this can lead to thermal overloads of the components, which may cause a fire. Therefore electric lines have to be protected against overloads! Also the batteries have to be protected against short circuit and overload!



**CAUTION:** Inappropriate use of battery systems can lead to the formation of gas causing an explosion hazard.

**Obey the relevant regulations and instructions for the operation of battery systems! (Battery capacity minimum 10 times charging current)**

## Notes on safety

### Persons responsible for safety

#### a) Operator

The operator is any natural person or legal entity making use of the system or having the system operate by a third party. The operator or his safety representative has to ensure the following:

- All valid directives, advice and laws are followed.
- Only qualified staff may operate the system.
- The instructions for use have to be available for the staff.
- Staff, who are not qualified, must not operate the system.

#### b) Qualified Staff

Qualified staff are persons who are entitled by the person responsible for the safety of the system to operate the system and to recognise and judge and avoid possible dangers based on their technical training and experience and knowledge of the relevant standards and regulations for the prevention of industrial accidents and who are familiar with the operating conditions of the system. (Definition based on ICE regulation 364)

### Operating conditions for Pico Micro Hydro Power Plants Types KT100/ KT340/ KT1100

- The system must not be connected directly to the public electric grid. A direct connection may destroy the Pico Micro Hydro Power Plant.
- Pico Micro Hydro Power Plants must not be operated in an environment containing explosion hazards, extensive quantities of dust, acids, corrosive substances or gases!
- During operation of the Pico Micro Hydro Power Plant the ambient temperature has to be in the range between 0° C and 40° C (32° F and 104° F). This is not applicable for other components (Energy System Manager, Battery, etc.). For the other components the relevant operating conditions have to be followed.
- The technical data indicated on the rating plate of the generator are only valid for operation up to 1,000 m (3,300 ft) above sea level. Operation in higher altitudes will cause power loss.
- Humidity has to be in the range between 40% at 45°C (113° F) and 80% at 20°C (68° F) ambient temperature.
- Pico Micro Hydro Power Plants may only be used inside dry rooms (electric machine room). The maximum admissible power calculated from maximum performance and nominal rotation speed must not exceed the limits of the admissible wave load. The admissible wave load will not be exceeded, if the system is used correctly.
- The permanently agitated synchronous generator must only be used combined with a suitable charge controller. The generator has to be protected by a motor overload switch.

## **Product Description**

The Micro Hydro Power Plants type "Pico" are based on a Pelton turbine with horizontal impeller.

These micro generating units have been developed for stand-alone solutions, especially for charging cycle resisting batteries. The turbine transforms the kinetic energy of the water into electric energy. The synchronous permanent magnet generator provides three-phase current. A suitable bridge rectifier converts the three-phase current into co-current flow.

A suitable energy management system avoids overcharge of the battery.

### **There are four different options for application:**

1. Charging the battery by MPPT (Maximum Powerpoint Tracker) charge controller. The MPPT charge controller will search for the best working point of the turbine (ideal speed related to net head). Thus the system can be used with various heads without further modifications of the system. As soon as the battery is completely charged, the charge controller will switch to conservation charging. The load of the generator will be reduced and the turbine will work at runaway speed.
2. As soon as the battery is completely charged the generated electric energy will be used by a load resistance for heating (of air or water). Parallell charge controller
3. Closing of an electric ball valve with spring return in the feed line. As soon as the battery is completely charged the charge controller will give a signal to close the valve. The valve will remain closed till the battery needs to be charged again. The critical voltages for opening or closing of the ball valve have to be provided by the manufacturer of the battery.
4. Heating of a water boiler or of air: The heating elements will be connected directly with the generator. The technical specifications of the heating elements have to meet exactly the application.

### **Permanently agitated synchronous generator**

Vertical construction IMV1 with extended shaft end for overhung assembly of impeller.

The generator provides at nominal speed 3 x 24 Volt alternating current.

The rotor is equipped with Neodym- Magnets, therefore no exciter is necessary

protection: IP54

1,8-times runaway speed

### **Turbine housing**

Housing made of cast aluminium with collet for fixing on DN250 or DN400 plastic pipe socket

3 x inside thread G1" for fixing of jets and bayonet couplings

KT100/KT340 → collet diameter = 250mm

KT1100 → collet diameter = 400mm

### **Pelton wheel**

Aluminium hub

Pelton buckets made of Polyamide with 30% fiber glass content

Cut out SK=12,5mm

### **Jets**

number: 1 to 3 depending on water quantity

Material: brass

Nozzle aperture d=12mm

**Options:** manual adaption of jet including pressure gauge

## Installation

### Assembly and Operation



Installation position:

The turbine has to be placed on a suitable pipe  
Internal diameter of pipe 250 mm à KT100/KT340  
Internal diameter of pipe = 400 mm à KT1100  
Impeller horizontal, shaft of generator points down  
No fixing in pipe necessary!



The water leaves the turbine without pressure, therefore minimum distance between Pelton wheel and water level at outlet 300 to 400 mm!

The impeller must not be submerged in the water outlet and the water has to flow freely without generating splash water.



The water outlet has to be ventilated!

Choose the right dimension for the water outlet pipe!

The discharge after the turbine must not be filled completely with water in order to have the outlet ventilated.

Backwater in the outlet will flood impeller and generator.



During operation the Pico-turbine must not be taken away from the pipe.

Risk of injuries by rotating Pelton wheel.

Prior to setting into operation all connections of hoses and bayonet couplings have to be checked for proper connection.



Never store turbine upside down

(Shaft of generator has always to point down)



The turbine must only be operated at an ambient temperature in the range between 0° C and 40° C (32° F and 104° F).



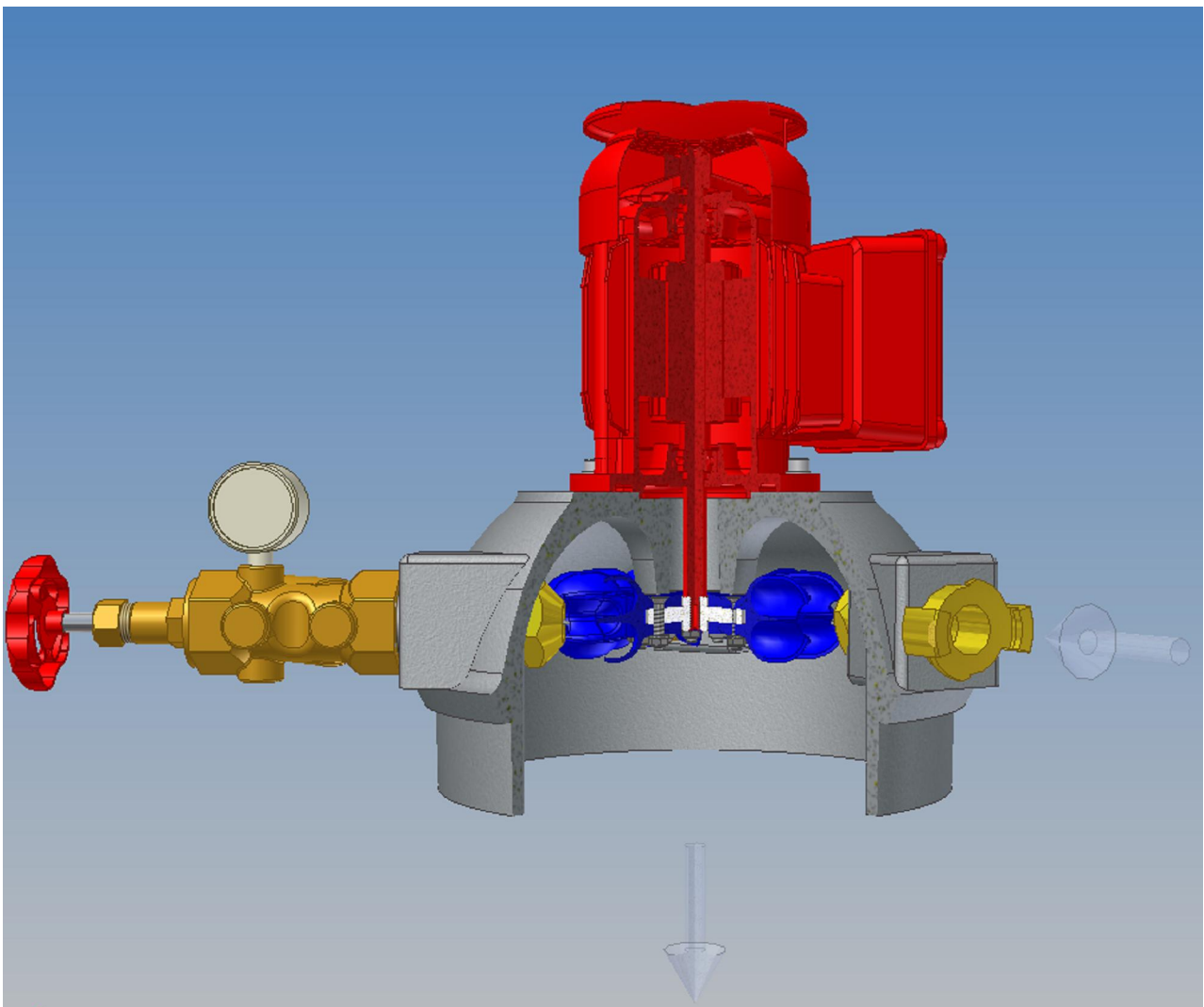


Operation in an environment containing explosion hazards and aggressive atmosphere prohibited!



All electric connections have to be protected against contact.  
The system has only to be connected at zero-potential!

### Schematic Plan of Pico- Micro Hydro Power Plant



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