GANZ ENGINEERING AND ENERGY PRODUCTION MACHINERY LLC.

CONTAINER-INSTALLED MINI HYDRO POWER PLANT

GANZ TURBINES IN ALL OUTPUT RANGES

Ganz EEM is the only manufacturer of water turbines in Hungary.

The history of turbine manufacturing in the company stretches back to the 1860s. The output range of Ganz turbines is available from the smallest, 50 kW units up to medium sized machines with an output of 50 MW or even higher. Manufactured types: Pelton, Francis, Kaplan, Tubular, Pit and S-type turbines. We also supply cooling water circulation pump – electric motor - recuperative hydro turbine machine groups arranged in common shaft line, which enable energy savings in thermal power plants. Our engineers design the water turbines using theoretical calculations, computer simulations and on the basis of small-scale model experiments performed in our certified laboratory. We determine the type of water turbine necessary depending on available head and water flow rate. The turbines may have a horizontal, vertical or inclined shaft.

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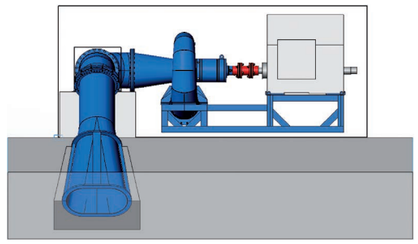
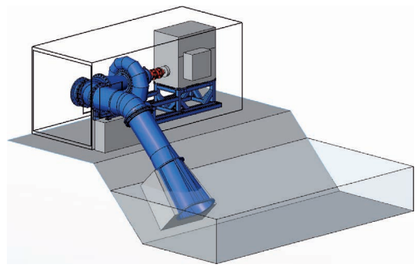
ALL OVER THE WORLD THE UTILISATION OF REMOTE, ECONOMICALLY VALUABLE AREAS IS MADE DIFFICULT BY THE FACT THAT THE CONSTRUCTION OF THE ELECTRIC NETWORK IS COSTLY AND TIME DEMANDING. GANZ EEM OFFERS A SIMPLE, FAST AND COST-EFFICIENT SOLUTION FOR CONNECTING REMOTE AREAS RICH IN HYDRO-ENERGY TO THE FLOW OF THE ECONOMY WITH ITS CONTAINER-INSTALLED TURBINE SOLUTION.

We are able to offer turnkey solutions. On the basis of the analysis of the on-site hydrological conditions and needs, we can offer for the type of the plant, produce it and put the device into operation. In case the takeover price is guaranteed by state a financial offer can be completed our service. The unit developed by Hungarian engineers is a compact, mini hydro power plant which is fitted into a standard container. The mini HPP can be put in operation in a short space of time, after transportation to the location, and can be even remotely operated and monitored via remote control system.

The container-installed mini hydro power plant is suitable for industrial or residential electricity supplies in areas where there is no electric network, or the objective may be to replace an existing expensive (for example diesel-generated) supply with a cheaper system based on an available water energy source. The condition for the installation and operation of the mini hydro power plant is a potentially continuously available supply of hydro energy with which electricity can be generated.





The great advantage of the container installed mini hydro power plant is, that after transportation to the site, it can be installed easily, and the time required to initiate the production of energy minimized. After providing the conditions required for operation and connecting the turbine to the water supply, it can be put into operation in just a short amount of time.

At our premises all the units were installed into the container which is needed to operate, control and monitor the power plant.

The battery unit provides the power for the control system when the turbines are stopped and, if required, it sends information to the remote monitoring system via remote controll system.

Without a local electric network connection, a remote controlled diesel generator provides the electricity needed to start up the power plant (black start).

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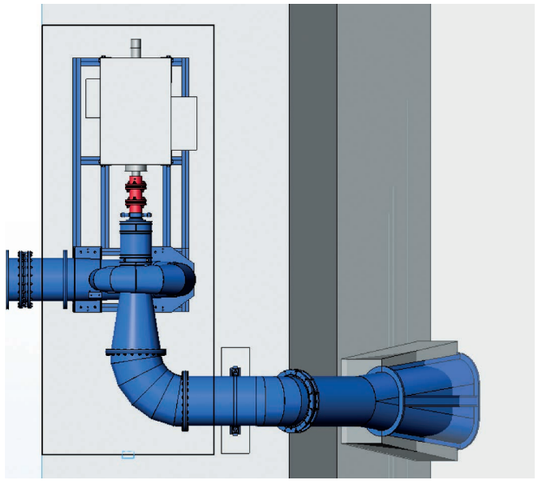
AREAS OF APPLICATION

- POWER SUPPLY FOR REMOTE AREAS WHERE THERE IS NO ELECTRIC NETWORK
- REPLACEMENT OF EXISTING SUPPLY SYSTEM
- ELECTRICITY SUPPLY FOR NEWLY DEVELOPED INDUSTRIAL PLANTS, MINES SAWMILLS, ETC. THAT ARE FAR FROM THE ELECTRIC NETWORK
- CHEAP, LOCALLY GENERATED ENERGY SYSTEM
- POWER SUPPLY FOR REMOTE TOURISM FACILITIES FAR AWAY FROM DEVELOPED AREAS

GENERAL SPECIFICATIONS

Standard sized container installed hydroelectric power plant conception

In the interests of quick construction of the mini-hydro plant we developed a power plant mounted in standard sized container. The system consists a generator which is driven by a small Francis turbine and both are installed in a container with controll system as basic solution for 400 V, 3-phase, 50 Hz power generation. The rated operation point of the basic design is 60 m head and 1 m^3/s flow that provides 500 kW electric power. For the full operating range see the Hill diagramm. *(page 7)*



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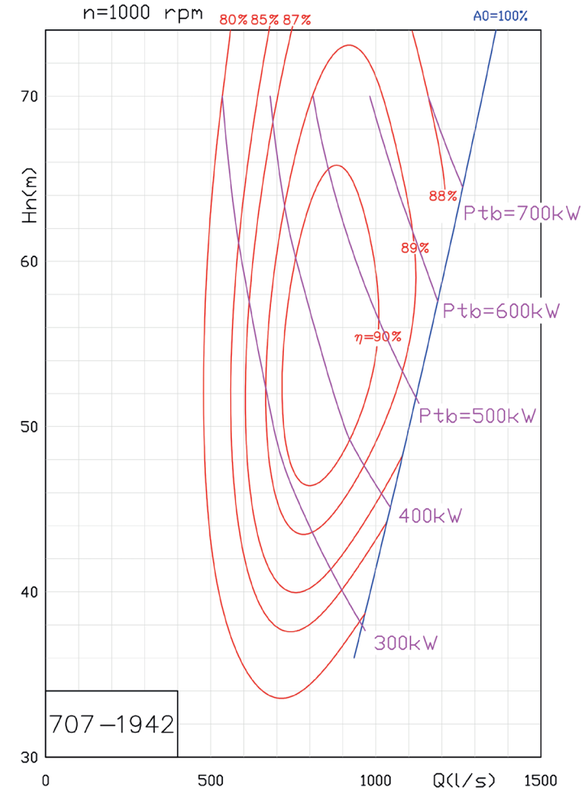
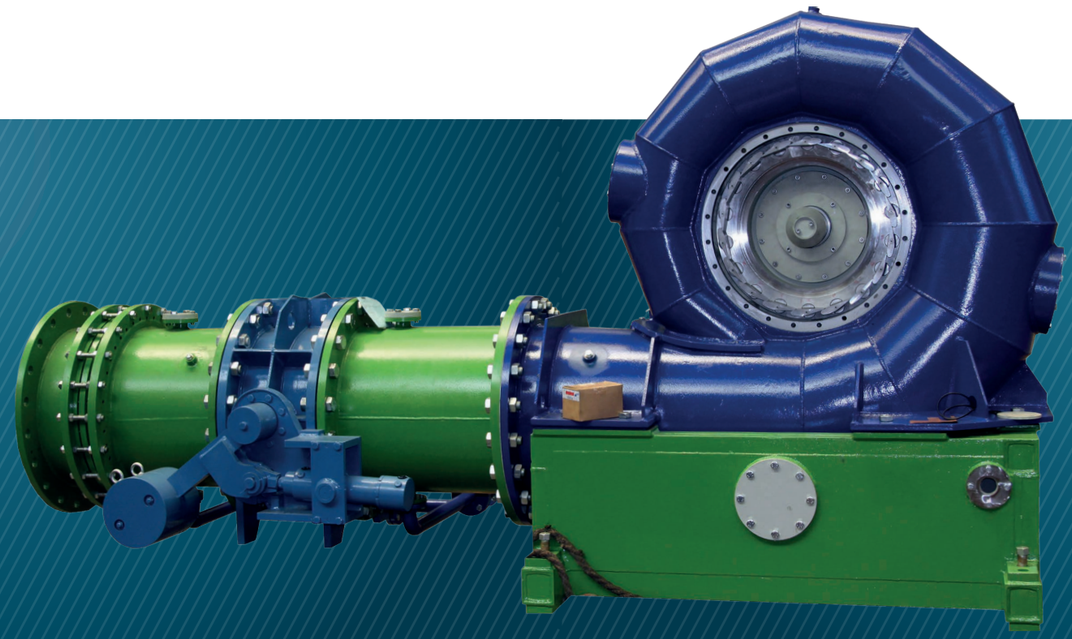
Extension of operating range

Due to economical and technical considerations we can multiplicate container-installed mini hydro power plant or offer other tailor made solutions. In case of conditions are different from the basic design, we can offer cascade or parallel arrangement of the turbines. Cascade arrangement is used if the head is higher, while parallel arangement is used if the flow is higher than the basic



Hill diagram of turbine
Fs3/15/500-1000
n=1000rpm



MAIN COMPONENTS

- Francis turbine
- Generator
- Diesel generator set for black start
- Electrical switching equipment
- Regulation and control system

SYSTEM ADVANTAGES

- Green energy
- Economical solution
- Simple and safe transportation
- Quick and easy installation
- Operation in island mode
- Remote controll system

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COMPONENTS OF THE BASIC DESIGN

Container for mechanical parts

- Francis Turbine flexible coupled to the generator
- Air-cooled synchronous generator 3x400 V, 50 Hz (automatic exciter and voltage regulator), located on a common base frame with the turbine, Synchronizing equipment is optional
- Oil pressure unit for guide vane and main inlet valve operation
- Hydraulic operated main inlet valve with closing weight
- Optional: flywheel if the stability of the system it requires

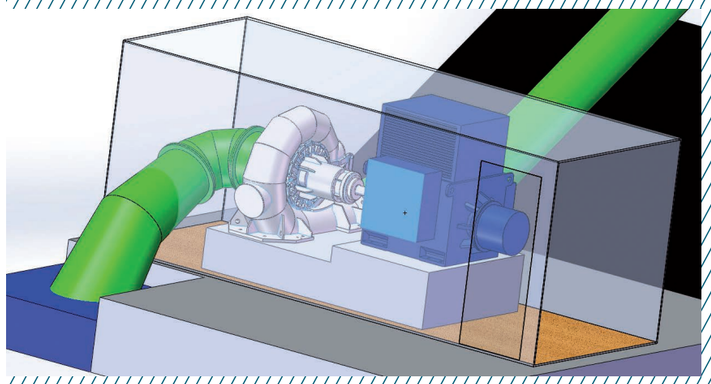
Container for electrical equipment

- Electrical switching equipment
- Protections
- Speed control
- Monitoring and management system with remote control (satellite, cellular networks, internet)

Diesel generator set for black start

OPTIONAL SCOPE FOR BASIC SOLUTION

- Penstock made of plastic or steel
- Design of the container's foundation and execution site works
- Generator voltage level can be 1 kV, 3 kV, 6 kV and 50/60 Hz
- Synchronizer device in case of connection to existing network
- Transformer for connection to high Voltage grid (6 kV, 10 kV, 20kV, 35kV, etc.)
- Architecture and engineering for water intake system



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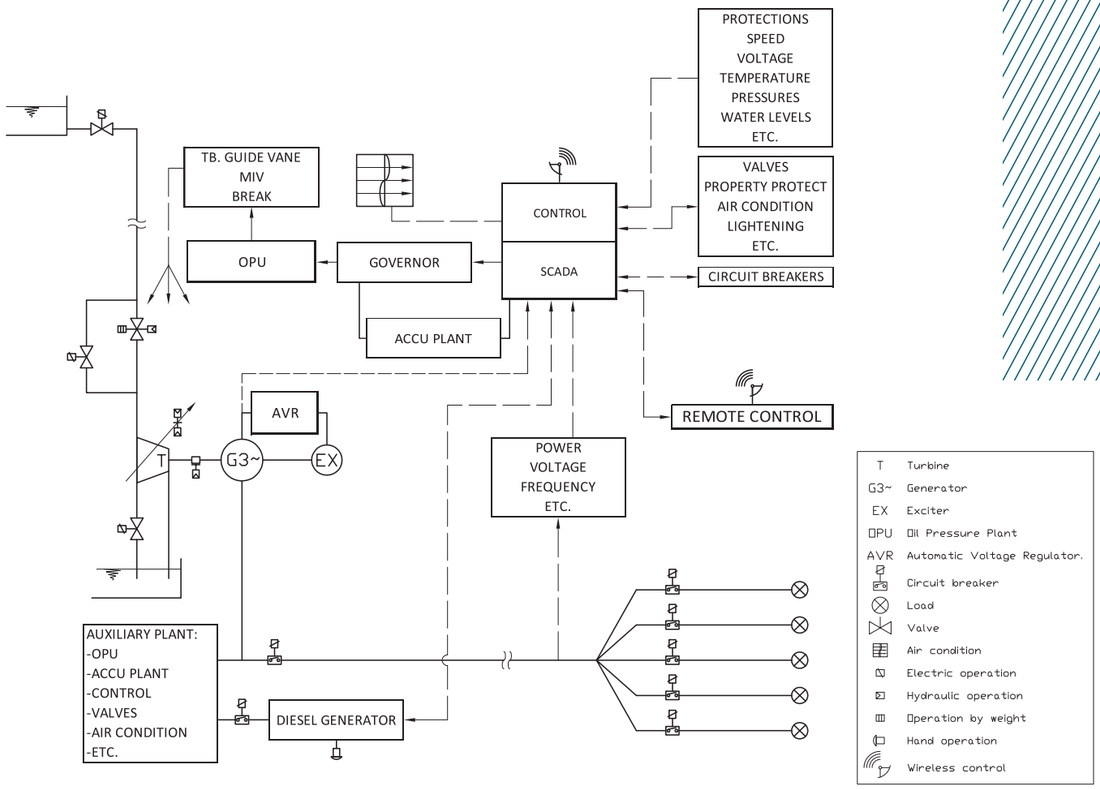
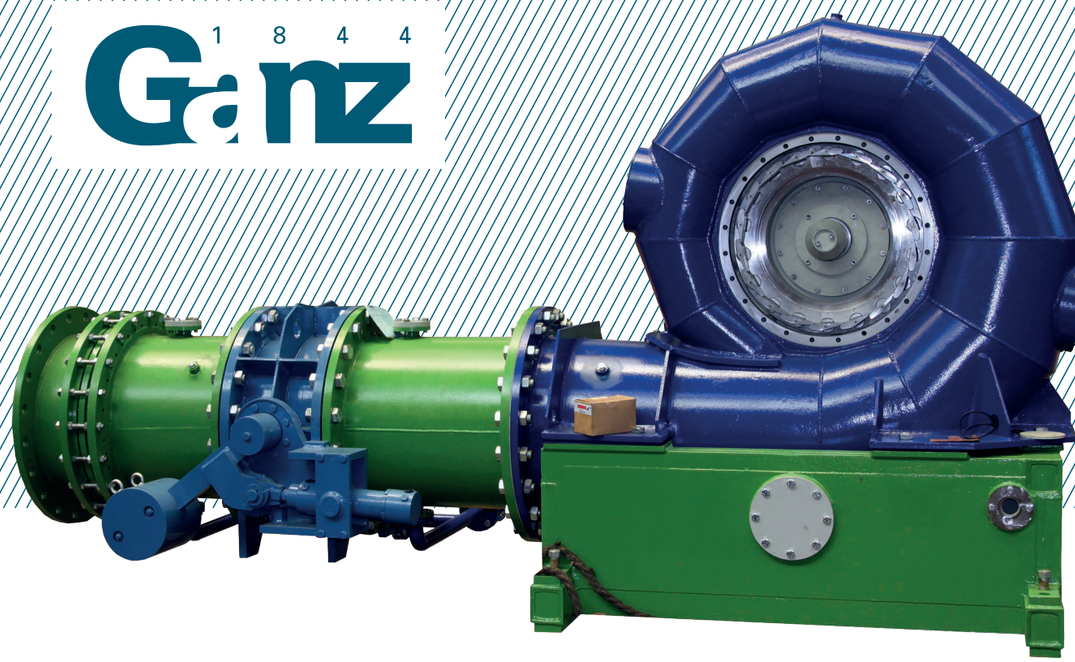
CONTROL SCHEMATIC DIAGRAM OF THE CONTAINER-INSTALLED HYDRO POWER PLANT





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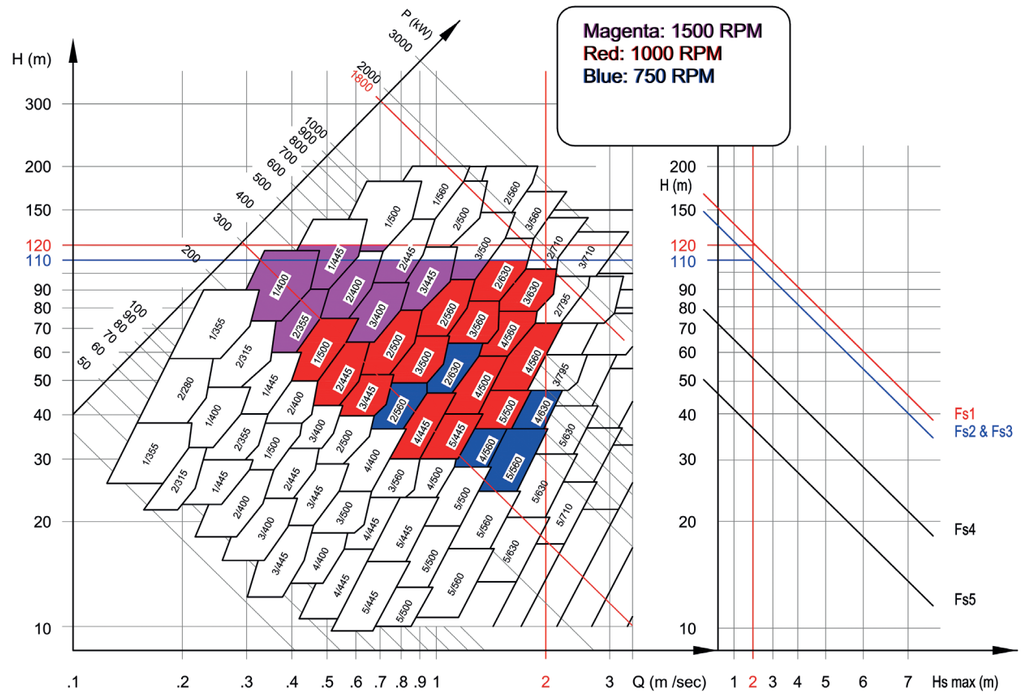
STANDARD SIZED CONTAINER-INSTALLED HYDRO POWER PLANT OPERATING RANGE



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