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Innovative Renewable Energy Solutions

PT Entec Indonesia

Consulting & Engineering

the entec cross flow turbine T15

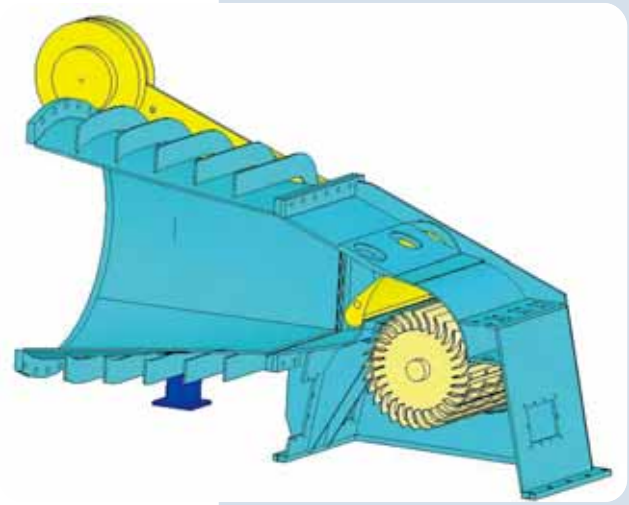
the optimal turbine solution for small plants with medium flow and head

Our goal is to offer customers an optimal design with high quality at a reasonable price. The long experience of our engineers in hydro power design and manufacturing provides an excellent and cost effective solution. The T15 turbine is the result of research at the University of Stuttgart (Germany), further development was made in Switzerland.

The T15 is produced under the supervision of highly qualified engineers in Indonesia. We offer:

- Standard turbine sizes up to 300 kW
- Flexible solutions
- Low civil construction costs
- Safety and long life equipment
- Technology transfer and training courses

T15 - the latest cross flow design developed by entec



The present improved turbine generation, the T15 Turbine, is based on a consequent optimising process conducted over many years. Numerous computer based modifications of the hydraulic profile were empirically tested in the laboratory of the Institute for Hydraulic Machines of Stuttgart University. The test turbine of 29 kW had a runner diameter of 300 mm, and the sophisticated measuring facilities guarantee for reliable results. The achieved improvements were the basis for the redesign of the turbine. Three models, with the standard diameter of 300 mm and runner diameters of 300 and 500 mm, for larger flows at low head, were developed. It is now possible, even with the limitation of simple production methods, to build very reliable and long lasting turbines with competitive high efficiency.

Big efforts were made to reach a good part load efficiency. With only 20% of the rated flow, the efficiency is still over 50%. This allows to reduce costs, because a single cell CFT will be sufficient in the majority of the applications. Double cell CFT's have two independent guide vanes, and require two regulation devices as well, which increases cost.

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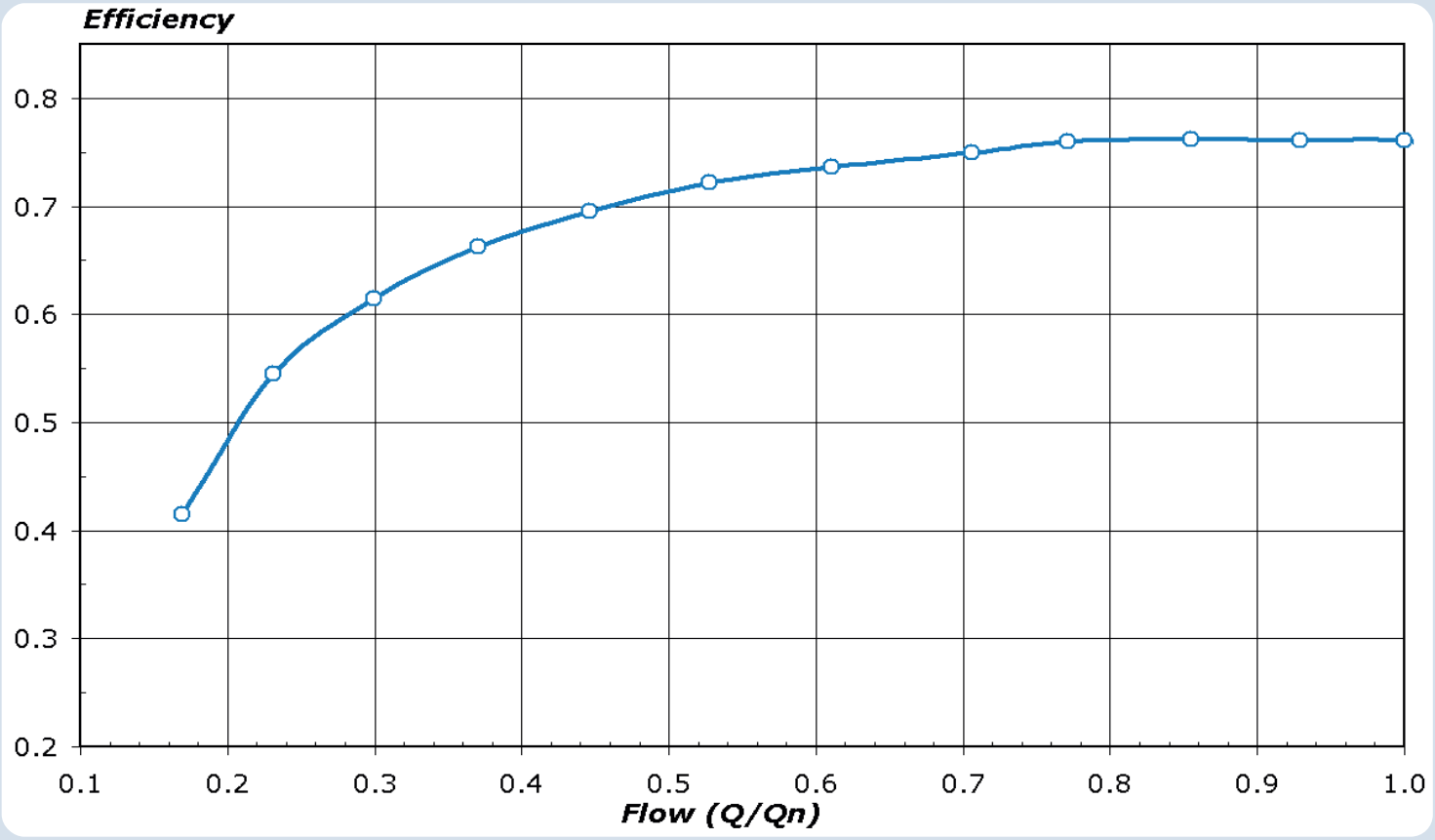
efficiency of T15 turbines

The efficiencies shown are in model tests on the 29 kW model turbine. The reference efficiency curve was recorded for 15 kW nominal power.

Under other hydraulic operating conditions (higher output and wider runner) the efficiency may reach 79% up to 100 kW, 79.5% up to 200 kW and 80% or more over 300 kW.



Efficiency diagram of model turbine in the Stuttgart laboratory (bearing losses included)

properties of the T15

The machine has a welded housing made from quality steel, rigid enough to withstand high operational stress and to enable a smooth operation. The design and the hydraulic layout result in minimised vibrations and noise level.

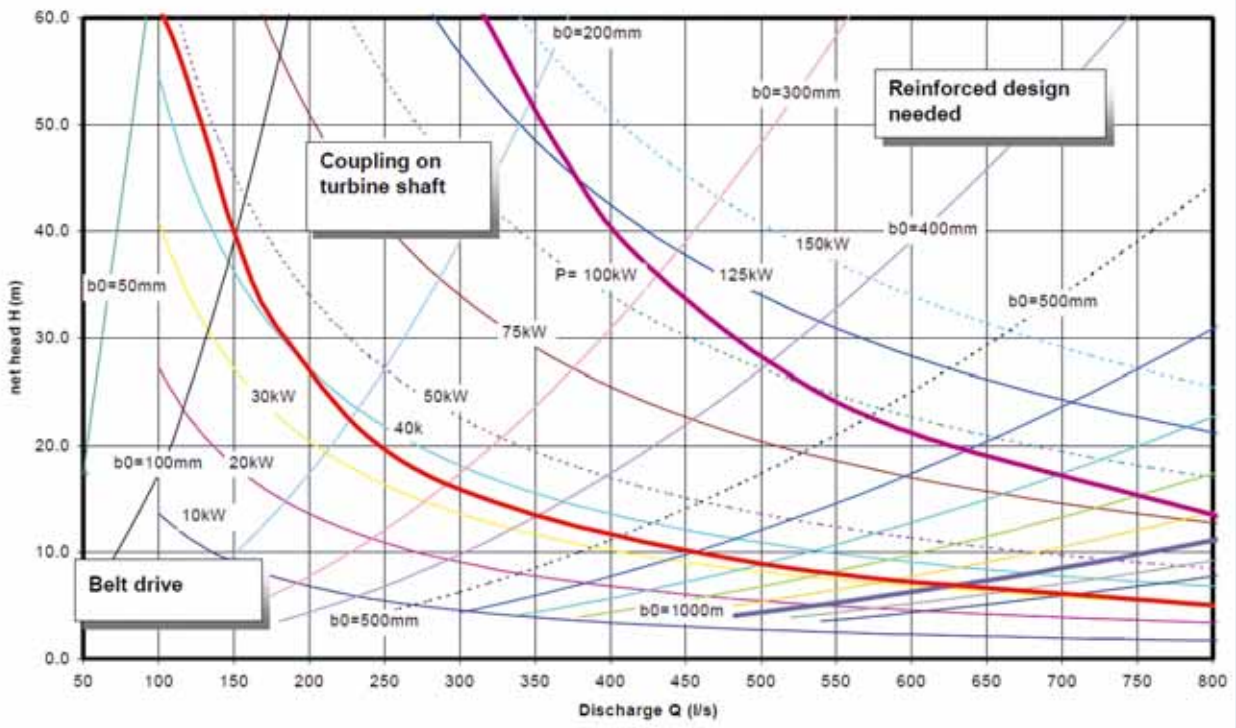
Special care was taken in the layout of the main bearings. The casing is designed in such a way that different options for the bearing system are available to cope with the specific site requirements, like flywheel or belt drive.

A sealing system is integrated in the side flanges. The guide vane unit can easily be taken out through a side flange for inspection, cleaning or replacement.

To obtain the guaranteed efficiency, the cylindrical runner is fabricated with high precision. The side discs are laser cut so that the entire runner cross section and blade positions are well defined. The runner blades consist of an optimised bright drawn steel profile, manufactured to our rigorous specifications.

application range

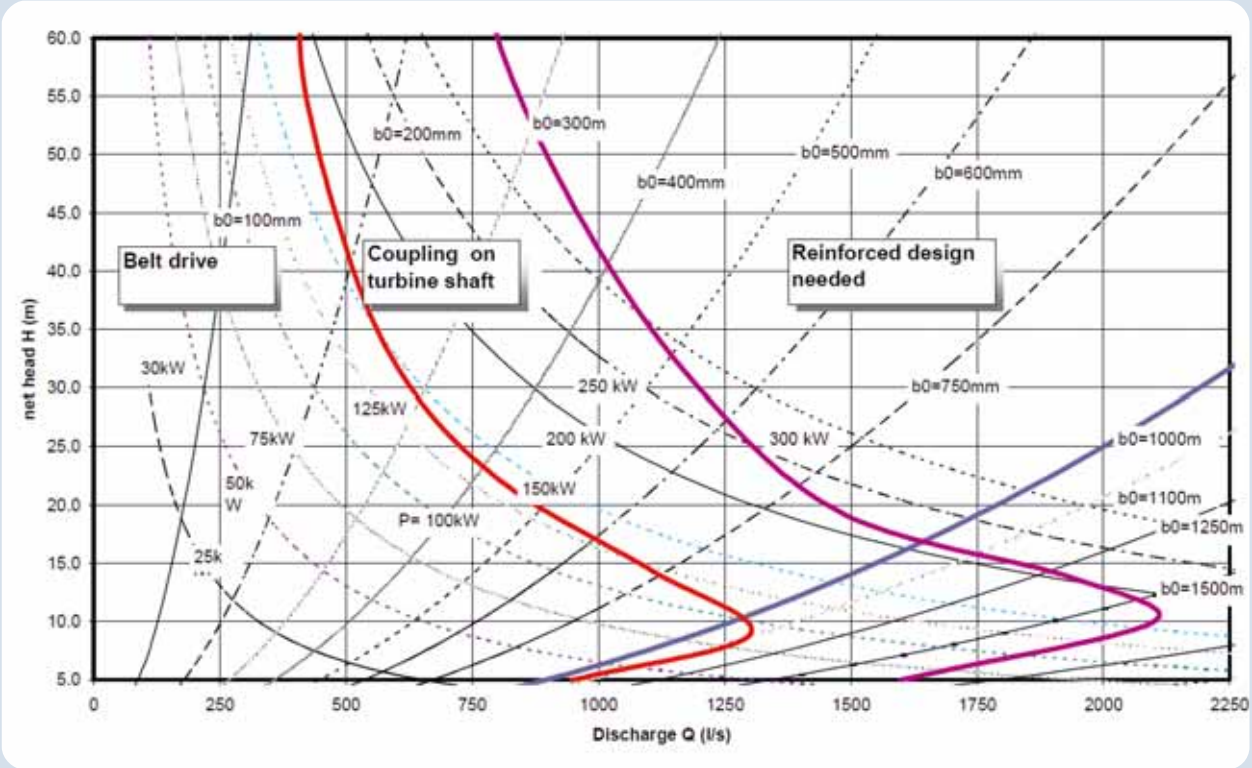
Runner diameter 300 mm: T15-300



Application range of the T15-300

Entec T15-300 turbine, coupling on turbine shaft; produced and installed in Indonesia

Runner diameter 500 mm: T15-500



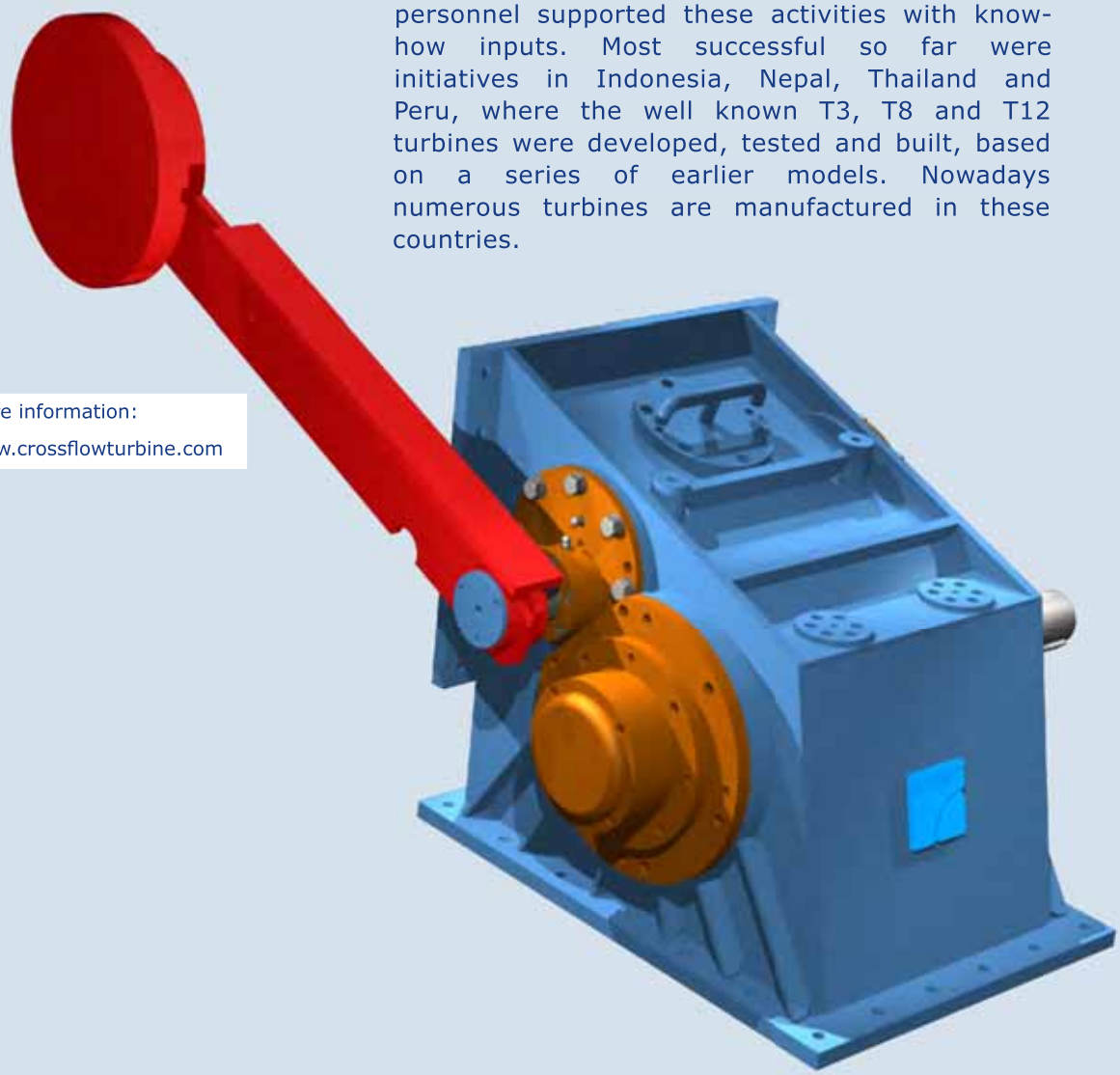
Application range of the T15-500

Installation of an entec T15-500 turbine with flat belt in Kirgystan

cross flow turbines... since 1925

In 1925, Donat Banki received a patent in Budapest for his BANKI turbine. This turbine applied the cross flow principle, where a free jet traverses a cylindrical runner in vertical direction to the turbine shaft. The runner can easily be adapted to the flow, by changing the width. This allows to build "tailormade" turbines for a broad application at different sites. The simple design allows good standardisation and manufacturing without sophisticated manufacturing facilities. The costs are low compared with other turbine designs.

For this reason, the Cross Flow Turbine (CFT) successfully conquered the market in industrialised as well as in less developed countries. Manufacturers started already in the Seventies to develop and build this turbine and entec personnel supported these activities with know-how inputs. Most successful so far were initiatives in Indonesia, Nepal, Thailand and Peru, where the well known T3, T8 and T12 turbines were developed, tested and built, based on a series of earlier models. Nowadays numerous turbines are manufactured in these countries.



More information:
www.crossflowturbine.com

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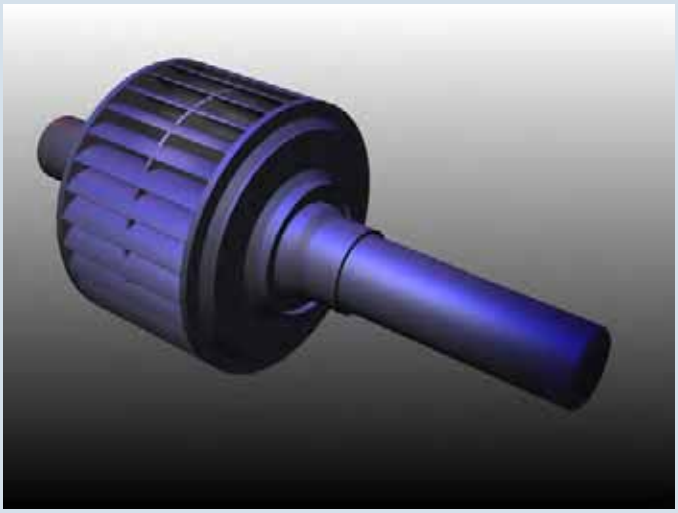
licensing of the T15

Entec offers its T15 Cross Flow Turbine design and manufacturing technology for licensing. Obtaining a manufacturing license will require an agreement to be signed by both, Entec AG as the licensor, and the client as licensee. Once licensing agreement has been signed, based on the terms agreed, the licensee will be in a position to design, manufacture and sell T15 Cross Flow Turbines according to established standards of quality and performance.



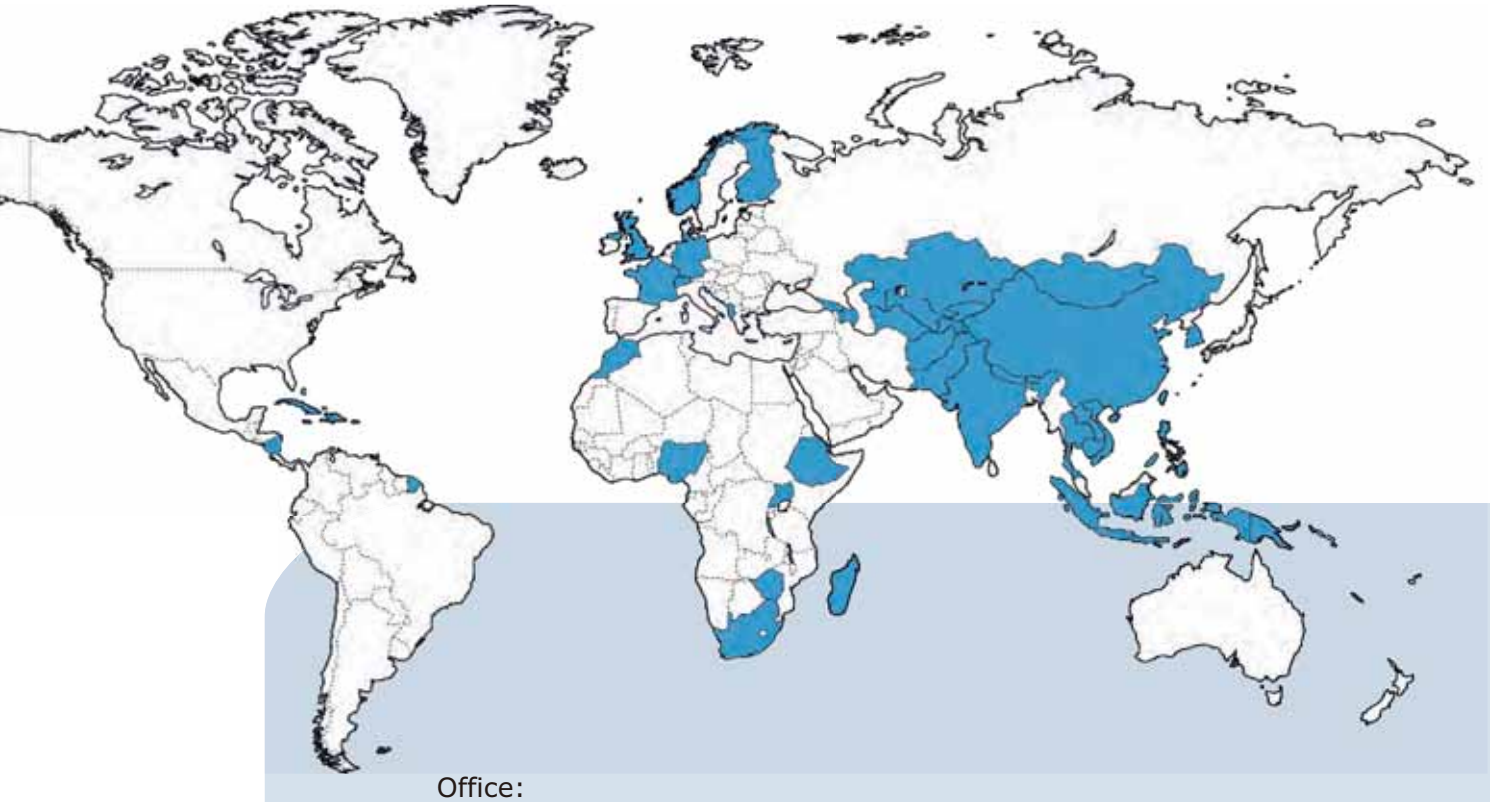
The licence package consists of:

a) Complete manufacturing information with a full set of detail and assembly drawings

b) Design tools, explanatory notes and design updates

c) Comprehensive technology transfer and two week training course for up to 10 persons in Indonesia

global experience



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