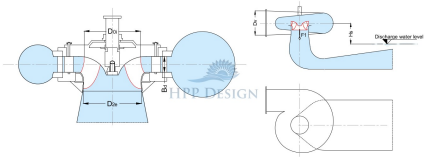
HPP-DESIGN — 54 HOLDING

Francis example — 120 m, 2 m³/s

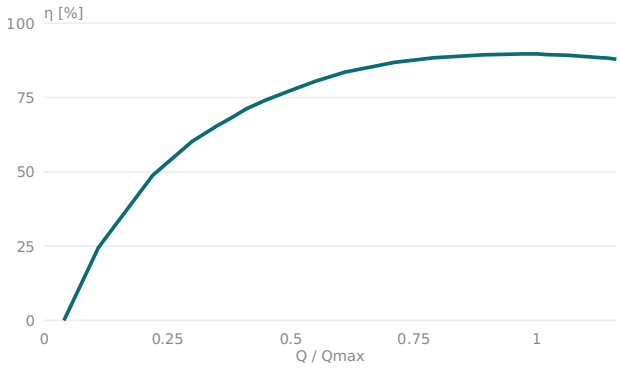
Francis turbine · Blog example · 2026-11-02

PRELIMINARY POWER	PEAK EFFICIENCY
2,083 kW	**89.66 %**

ROTATIONAL SPEED	COST ESTIMATE
750 rpm	turbine-generator set **667,000 €**



Efficiency curve



Q/QMAX	η [%]
0.04	0.00%
0.11	24.51%
0.22	48.84%
0.30	60.23%
0.35	65.44%
0.38	68.24%
0.41	71.23%
0.45	74.22%
0.50	77.41%
0.55	80.49%
0.61	83.58%
0.71	86.86%
0.79	88.41%
0.89	89.37%
0.97	89.66%
1.00	89.66%
1.02	89.47%
1.06	89.28%
1.10	88.79%
1.13	88.41%
1.14	88.31%
1.16	87.93%

Inputs

net head	120 m
max discharge	2 m3/s
frequency	50 Hz
layout	vertical
poles number	8

Power & efficiency

preliminary power	2,083 kW
max turbine power	2,069 kW
max electrical power asynchronous	1,928 kW
max electrical power synchronous	1,959 kW
peak efficiency	89.66 %

Speed & specific speed

speed	750 rpm
omega	78.54 rad/s
max runaway speed	1,225 rpm
specific speed	99.8
K	0.5528
nf over n	1.633

Flow

min flow	0.1843 m3/s
normalized min flow	184.3 l/s
flow runaway speed	0.8811 m3/s
qmin over q	0.0922
qf over q	0.4405

Cavitation

NPSH	4.034 m
Z2	6.126 m

Runner & hydraulic geometry

blades number	13
phi	0.2219
b0	0.2689
B0	89.33 mm
n0	0.1855
r0i	1.303
R0i	432.2 mm
D01	864.4 mm
r0e	1.516
R0e	503 mm
D0e	1,006 mm
outlet radius	331.8 mm
outlet diameter	729.9 mm
spiral case inlet diameter	547.7 mm
guide vanes height	89 mm
pipe connection for valve DN	921.3 mm

Generator & drivetrain

generator · power factor	0.9
generator · peak efficiency asynchronous	93.16 %
generator · peak efficiency synchronous	94.66 %

Forces & weights

generator · max hydraulic thrust	107.2 kN
generator · axial thrust	103.2 kN
generator · runner weight	4.004 kN

Cost estimate

unit power used for cost	2,119 kW
turbine-generator set (central estimate)	667,000 €
includes	turbine, inlet valve, governor, generator — ex-works
indicative range (blended estimate, wider uncertainty)	500,000 – 1,000,000 €
complete electromechanical package (indicative) adds control system, switchgear, transformer, transport and installation; ratio from NVE (2010) cost data	933,000 – 1,066,000 €
specific cost	315 €/kW
estimate Between two data sources; values joined smoothly.	blended
cost model	v2 (October 2026)
price index	Eurostat, Jun–Aug 2026

Not comparable with costs shown before 9 November 2026 (previous model).

What's included in this estimate? →

How to read this estimate →