Ship Resistance and Effective Power by the ITTC 1957 Friction Line

Frictional, residuary and total resistance and effective power of a ship from length, wetted surface and speed, by the ITTC 1957 line with a form factor.

Method: ITTC 1957 model–ship correlation line with a form factor (ITTC 1978 method)

Input parameters

Unit system: SI

Parameter	Value	Unit
Waterline length	120.00	m
Wetted surface area (0 to estimate by Mumford)	0	m²
Breadth (for the estimate)	20.000	m
Draught (for the estimate)	7.5000	m
Block coefficient (for the estimate)	0.70000	
Ship speed	15.000	kn
Form factor (1 + k), enter k	0.20000	
Residuary (wave) resistance coefficient	6.0000e-04	
Correlation allowance	4.0000e-04	
Water density (sea 1,025; fresh 1,000)	1,025.0	kg/m³
Kinematic viscosity (sea water 15 °C: 1.19 mm²/s)	1.1900	mm²/s

Calculated results

Parameter	Value	Unit
Wetted surface used	3,210.0	m²
Froude number V/√(gL)	0.22495	
Reynolds number VL/v	7.7815e+08	
ITTC 1957 friction coefficient	0.001579	
Total resistance coefficient	0.002895	
Total resistance	283.63	kN
Effective (towing) power R_T V	2,188.6	kW

Notes for this case

• C_T = (1 + k)C_F + C_R + C_A with C_F = 0.075/(log₁₀Re − 2)² (ITTC 1957). C_R comes from model tests or a series (Holtrop, Taylor, Series 60). Wetted surface by Mumford, S = L(1.7T + C_B B), when not entered.

Formula and method

$$C_F = \frac{0.075}{(\log_{10} Re - 2)^2}, \quad C_T = (1+k)C_F + C_R + C_A, \quad R_T = \frac{1}{2}\rho S V^2 C_T, \quad P_E = R_T V$$

$$S \approx L(1.7T + C_B B)$$

Variables

L_{WL}	Waterline length	m
S	Wetted surface area (0 to estimate by Mumford)	m²
B	Breadth (for the estimate)	m

T	Draught (for the estimate)	m
C_B	Block coefficient (for the estimate)	-
V	Ship speed	m/s
k	Form factor (1 + k), enter k	-
C_R	Residuary (wave) resistance coefficient	-
C_A	Correlation allowance	-
ρ	Water density (sea 1,025; fresh 1,000)	kg/m³
ν	Kinematic viscosity (sea water 15 °C: 1.19 mm²/s)	m²/s
F_n	Froude number V/√(gL)	-
Re	Reynolds number VL/v	-
C_F	ITTC 1957 friction coefficient	-
C_T	Total resistance coefficient	-
R_T	Total resistance	N
P_E	Effective (towing) power R_T V	W

Method and standards

Ship resistance by the ITTC friction line.

Assumptions and limits

- Calm deep water, clean hull, steady speed.

References

ITTC 1957 model–ship correlation line with a form factor (ITTC 1978 method)

Report details

Report reference	FCC-3P40-9D61 (the same inputs always give the same reference)
Generated	23 November 2026, 18:00 UTC
Calculator	Ship Resistance and Effective Power by the ITTC 1957 Friction Line
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/mechanical/marine/ship-resistance-ittc-1957

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.