JUMBO BLOCK ENGINEERING SUITE

JUMBO BLOCK Units

User Manual · Version 2.0.0

Table of Contents

1. Overview

JUMBO BLOCK Units is the comprehensive unit converter of the JUMBO BLOCK Engineering Suite for engineering and physics. It covers 26 categories across four groups: Mechanics & Physics, Electrical, Thermodynamics, and Other (chapter 13 lists all categories in full).

The underlying principle differs from classic pair converters: instead of selecting a source and a target unit individually, a value is entered in one starting unit, and Units immediately shows all units of the selected category converted simultaneously.

The program runs entirely locally in the browser as a single HTML file. There is no cloud connection, no server, and no user account.

Like CALC, UNITS does not exchange data with the suite's shared project.dbm. The calculation history is instead exported and imported in its own, UNITS-specific file format (chapter 8).

UNITS is one of several standalone tools in the suite (including HYDRO, PLAN, BUDGET, STATIC, TEMP, CALC, Project).

2. Getting Started

When units.html is opened for the first time, the “Length” category is pre-selected, the value is set to 1, and all length units are immediately shown with the converted result. The calculation history starts out empty.

There is no persistent storage of the calculation history in the browser (only the selected language is remembered locally). The history exists only in the memory of the open page until it is deliberately saved as a file via “Export” (chapter 8); reloading the page discards it.

3. Categories and Groups

The category selection list is organised into four visually separated groups:

- Mechanics & Physics: Length, Area, Volume, Mass, Force, Pressure/Stress, Energy/Work, Power, Torque, Speed, Acceleration, Density, Angle, Time, Volumetric Flow, Frequency/Rotational Speed, Dynamic Viscosity, Kinematic Viscosity (18 categories).
- Electrical: Electric Voltage, Electric Current, Electric Resistance, Electric Charge (4 categories).
- Thermodynamics: Temperature (1 category, see chapter 6 for the specifics of its conversion).
- Other: Data Size, Illuminance, Fuel Consumption (3 categories, see chapter 6 for fuel consumption).

Each category contains between 3 and 18 units (the complete overview with unit count per category is in chapter 13). Switching category automatically pre-selects the first matching unit as the starting unit and recalculates all results.

4. Performing a Conversion

Three input elements control the conversion: the category selector, the value input field, and the “From” selector (the starting unit within the selected category, with symbol and full name, e.g. “kN – Kilonewton”).

Any change to one of the three elements automatically triggers an immediate recalculation — no separate calculate button is required. The results list shows every unit of the current category as its own row with symbol, full name, and converted value; the row for the selected starting unit is highlighted (navy background).

If the entered value is empty or not a valid number, an error notice appears instead of the results list.

5. Number Formatting

The display of converted values automatically adapts to their magnitude: values below 0.001 or at or above 1 billion are shown in scientific notation with up to 8 decimal places; values below 1 with up to 8 decimal places; values below 1000 with up to 6 decimal places; all other values with up to 3 decimal places. All values are additionally shown localised according to language (decimal comma in German, decimal point in English).

6. Special Cases: Temperature and Fuel Consumption

All mechanical, electrical, and other categories (except Temperature and Fuel Consumption) convert via a simple linear conversion factor to a common base unit (e.g. metre for length, pascal for pressure). Two categories deviate from this, since a pure factor conversion is not physically sufficient here:

- Temperature: Celsius, Fahrenheit, Kelvin, and Rankine are related via their own conversion formulas with a zero-point offset (e.g. °C → K by adding 273.15, not by pure multiplication), since temperature scales have different zero points.
- Fuel consumption: litres/100 km, kilometres/litre, and mpg (US) and mpg (UK) are related to each other reciprocally (inversely), not linearly. Units uses its own conversion formulas for this (e.g. km/l = 100 ÷ l/100km); at a consumption of 0 l/100 km, conversion into the reciprocal units is mathematically undefined and is shown as an error.

7. Calculation History

The “Save to history” button adds the currently displayed conversion (category, starting unit, entered value, and all converted values) as a new entry at the top of the calculation history. Unlike in CALC, this does not happen automatically with every input, but only on explicit click.

Every history entry shows the category, the entered value with its starting unit, and all remaining converted units as detail lines. Clicking a history entry restores the associated category, starting unit, and entered value in the main form and recalculates the results.

The “Clear history” button empties the list immediately and without confirmation.

8. Exporting and Importing History

“Export” saves the entire current calculation history as a standalone JSON file named YYYYMMDD_HHMMSS_units.dbm. This file is not an excerpt of the suite's shared project.dbm, but its own UNITS format, identifiable by the field “application”: “UNITS” within the file; no SHA-256 hash check takes place.

“Import” opens the file selection dialog and reads a file previously exported by UNITS. Each history entry is checked individually: category and starting unit must exist in the current version of UNITS, the entered value must be a valid number, and at least one converted result must be numerically valid — otherwise the affected entry is skipped during import. If the file as a whole is not a valid UNITS format, the message “Invalid UNITS file.” appears and nothing is applied. A successful import completely replaces the currently displayed history with the (valid) contents of the file.

9. PDF Report

The “PDF Report” button opens a new window with a standalone, print-ready report: date/time of creation, the complete numbered calculation history with category, starting value, and all converted units, and a footer with a copyright notice. Within the report window, a separate “Print / PDF” button triggers the browser's print dialog.

If the calculation history is empty, the report shows a corresponding empty-state text instead of a list.

10. Language (German/English)

Language switching is handled via the suite's global menu (menue.js) above the tool. UNITS fully switches all labels, category and unit names, number formatting (decimal separator), and the PDF report between German and English, without altering the calculation history. The most recently selected language is remembered locally in the browser and automatically reapplied the next time the tool is opened.

11. Limitations, Notes and Best Practices

- UNITS does not exchange data with the shared project.dbm of the other suite tools; the export/import mechanism serves solely to save and restore its own calculation history.
- For fuel consumption, entering 0 l/100 km results in a mathematically undefined conversion into the reciprocal units (km/l, mpg) and is shown as an error.
- All conversion factors are fixed within the tool (no live rates or similar are required, since these are physical units) and do not change due to external influences.
- Without persistent browser storage, the calculation history is lost when the page is closed or reloaded, unless an export has been made.
- “Clear history” takes effect immediately and without confirmation; exporting beforehand is recommended if the current history should be preserved.
- An entry is only added to the history when “Save to history” is explicitly clicked — merely viewing a conversion is not sufficient.

12. Quick Reference of Buttons

Button	Meaning
Save to history	Adds the current conversion as a new entry to the calculation history
PDF Report	Opens the print-ready report of the calculation history
Export	Saves the calculation history as a standalone .dbm file
Import	Reads in a previously exported UNITS history file
Clear history	Empties the calculation history immediately and without confirmation

13. Complete Category List

Category (Group)	Units (Count) · Examples
Length (Mechanics & Physics)	11 · mm, cm, m, km, in, ft, yd, mi, nmi, um
Area (Mechanics & Physics)	11 · mm², cm², m², a, ha, km², ft², ac
Volume (Mechanics & Physics)	12 · ml, l, m³, ft³, US gal, UK gal, bbl
Mass (Mechanics & Physics)	9 · mg, g, kg, t, lb, oz, st, US ton, UK ton
Force (Mechanics & Physics)	6 · N, kN, MN, dyn, kgf, lbf
Pressure / Stress (Mechanics & Physics)	11 · Pa, kPa, MPa, N/mm², bar, atm, psi, torr
Energy / Work (Mechanics & Physics)	11 · J, kJ, kWh, MWh, cal, kcal, BTU, eV, ft·lb
Power (Mechanics & Physics)	8 · W, kW, MW, GW, PS, hp, kcal/h, BTU/h
Torque (Mechanics & Physics)	6 · Nm, kNm, N·mm, lbf·ft, lbf·in, kgf·m
Speed (Mechanics & Physics)	5 · m/s, km/h, mph, kn, ft/s
Acceleration (Mechanics & Physics)	4 · m/s², g, ft/s², Gal
Density (Mechanics & Physics)	6 · kg/m³, g/cm³, g/l, kg/l, lb/ft³, lb/US gal
Angle (Mechanics & Physics)	6 · deg, rad, gon, arcmin, arcsec, rev
Time (Mechanics & Physics)	7 · ms, s, min, h, d, week, year
Volumetric Flow (Mechanics & Physics)	7 · l/s, l/min, l/h, m³/h, m³/min, GPM, CFM
Frequency / Rotational Speed (Mechanics & Physics)	6 · Hz, kHz, MHz, GHz, rpm, rps
Dynamic Viscosity (Mechanics & Physics)	4 · Pas, mPas, cP, P
Kinematic Viscosity (Mechanics & Physics)	4 · m²/s, mm²/s, cSt, St
Electric Voltage (Electrical)	3 · mV, V, kV
Electric Current (Electrical)	3 · mA, A, kA
Electric Resistance (Electrical)	4 · mOhm, Ohm, kOhm, MOhm
Electric Charge (Electrical)	4 · mC, C, mAh, Ah
Temperature (Thermodynamics)	4 · °C, °F, K, °R (see chapter 6)
Data Size (Other)	10 · bit, B, KB, MB, GB, TB, KiB, MiB, GiB, TiB
Illuminance (Other)	3 · lx, klx, fc
Fuel Consumption (Other)	4 · l/100km, km/l, mpg (US), mpg (UK) (see chapter 6)