



SI Unit Converter — Instruction Guide

The SI Unit Converter converts one value between two units of the same quantity, across 24 unit domains, using exact factors built from the unit definitions.

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Contents

1. Purpose and application	2
2. Standards basis	2
3. How the calculator ensures accurate results.....	3
4. Input fields	3
5. Units and unit conversion	4
6. Calculation method	7
7. Reading the results	8
8. Worked examples	10
9. Refusals and troubleshooting.....	13
10. Scope and limitations	14
11. References	15

1. Purpose and application

Use the SI Unit Converter when a reading, a tolerance or a specification is stated in one unit and you need it in another. It shows the conversion factor, says whether that factor is exact, and gives the result at three precisions.

Typical uses:

- Converting a gauge reading in psi to kPa for a calibration certificate.
- Converting a torque specification from lbf·ft to N·m.
- Converting a laboratory temperature, or a temperature tolerance, from °C to °F.
- Checking how many digits a converted value can honestly carry (NIST SP 811 B.7.2).

The converter teaches the factor and the rounding rule. Its unit table is the same one the TUR, TAR, Type B and GUM budget calculators use to scale units within a domain, so a factor learned here is the factor those calculators apply.

2. Standards basis

Standard	What the calculator takes from it
NIST SP 811:2008, Appendix B.8	The conversion factors to SI. Each of the 60 factors SP 811 prints is checked to the printed digits; SI-prefixed units need no row; the acre is a documented exception (5.4).
NIST SP 811:2008, B.7.1 and B.7.2	Rounding: ties to even (B.7.1 rule 3), and the number of digits consistent with the rounding error of the entered value (B.7.2).
NIST SP 811:2008, footnotes 9, 12, 13, 20, 23	The exact Btu (IT), the limit on mercury manometer factors, the exact cubic inch, the international nautical mile and the exact pound-force.
NIST SP 330 (the SI)	The coherent SI unit of each domain (m, kg, K, Pa, J and so on) and the kelvin as the base of all temperature conversions.
International yard and pound definitions (1959)	1 in = 0.0254 m exactly and 1 lb = 0.453 592 37 kg exactly. All inch-pound factors are built from these.
Federal Register 85 FR 62698 (2020)	Deprecation of the U.S. survey foot from 31 December 2022. The acre uses the international foot, not SP 811's survey-foot value.
ISO 80000-4	The conventional millimetre of mercury, defined from a conventional mercury density and standard gravity.
ISO/IEC 17025:2017, 7.11.2	Software used for calculations is validated before use. MT-VAL-SI-002 is the developer's validation evidence; a laboratory's own validation under ISO/IEC 17025:2017 7.11 may use it.

3. How the calculator ensures accurate results

Code computes every number; the language model only explains. The entered value is held as an exact fraction of the digits you typed. Each factor is an exact fraction built from its definition, so 1 psi is exactly $8\,896\,443\,230\,521 / 1\,290\,320\,000$ Pa, not a rounded decimal. Only π -based factors use double precision, because π cannot be a fraction. The display rules never show more digits than the factor supports. The model receives the finished values and must copy them, not recompute them.

Validation record MT-VAL-SI-002 Rev B found all 177 unit factors equal to their definitions and all 60 NIST SP 811 printed values in agreement. 12,000 random conversions matched an independent reference with 0 mismatches on the headline, full-precision and B.7.2 values. 16 π conversions differed only in the 15th digit, within the 10^{-13} criterion. All 6 below-absolute-zero inputs were refused, and live tests C1 to C6 passed on the card and the PDF. The method is described in the white paper [Deterministic Computation in AI-Assisted Metrology](#) (Racen, 2026).

4. Input fields

The form has four fields, all required. The two unit lists depend on the domain you choose.

Field	Required	Format or options	What it means (form help text)
Unit domain	Yes	One of 24 domains (4.1)	"Conversions are only valid within one domain (length to length, mass to mass, and so on). Choosing a domain scopes the unit lists below."
Value	Yes	A bare number, e.g. 5.0	"The numeric quantity to convert"
From unit	Yes	A unit from the selected domain's list (section 5)	"The unit you're converting from"
To unit	Yes	A unit from the selected domain's list (section 5)	"The unit you're converting to"

4.1 Unit domain

The 24 options are: Length, Mass, Temperature, Temperature difference, Pressure, Time, Volume, Area, Force, Torque, Energy, Power, Frequency, Rotational speed, Angle, Voltage, Current, Resistance, Capacitance, Inductance, Conductance, Electric charge, Magnetic flux density and Magnetic flux.

Temperature and Temperature difference offer the same five units but behave differently. Temperature converts a point on a scale, with offsets (23.5 °C is 74.3 °F). Temperature difference converts an interval, with no offset (0.5 °C is 0.9 °F). Choose Temperature difference for tolerances, drifts and uncertainties stated in degrees. A coefficient per degree (ppm/°C) converts by the inverse factor: per °F = per °C $\times$ 5/9.

4.2 From unit and To unit (conditional)

Both lists are filled from the Unit domain you select, so a pressure unit cannot be paired with a length unit. Each option shows the unit name and its symbol, for example "pascal (Pa)". Where the name already has parentheses, the symbol is in square brackets, for example "pound (avoirdupois) [lb]". Choosing the same unit in both fields is allowed; the value is returned unchanged.

4.3 Value

- Enter a plain number. A sign is allowed, and scientific notation such as 1.20e3 is read.
- Use a period for the decimal mark. "1,5" is refused.
- Do not type the unit. "30 psi" is refused; the unit belongs in From unit.
- The magnitude must be zero or between 1e-30 and 1e30.
- **Type every digit you read, including trailing zeros.** The B.7.2 result depends on the last digit you type: "30.0" is read to 0.1, "30" to the units digit.

5. Units and unit conversion

The converter offers 177 units in 24 domains. Each unit carries one factor to its domain's coherent SI unit. A conversion multiplies by the From factor and divides by the To factor, so every pair in a domain works.

Domain	SI unit	Units offered	Factor basis
Length	m	m, cm, mm, μm , nm, pm, km, in, ft, yd, mi, mil (0.001 in), nmi	Exact
Mass	kg	kg, g, mg, μg , ng, t, lb, oz, gr, slug	Exact
Temperature	K	K, mK, $^{\circ}\text{C}$, $^{\circ}\text{F}$, $^{\circ}\text{R}$	Exact, with offsets
Temperature difference	K	K, mK, $^{\circ}\text{C}$, $^{\circ}\text{F}$, $^{\circ}\text{R}$	Exact, no offsets
Pressure	Pa	Pa, mPa, μPa , kPa, MPa, GPa, bar, mbar, psi, atm, Torr, mTorr, mmHg (conventional), inHg (60 $^{\circ}\text{F}$), inHg (32 $^{\circ}\text{F}$)	Exact, except the two inHg units (tabulated, 6 digits)
Time	s	s, ms, μs , ns, ps, min, h, d	Exact
Volume	m^3	L, mL, μL , m^3 , cm^3 , gal, liq qt, liq pt, fl oz, in^3 , ft^3	Exact
Area	m^2	m^2 , cm^2 , mm^2 , in^2 , ft^2 , yd^2 , acre, ha	Exact
Force	N	N, mN, μN , kN, MN, dyn, lbf, ozf, kgf	Exact
Torque	$\text{N}\cdot\text{m}$	$\text{N}\cdot\text{m}$, $\text{N}\cdot\text{cm}$, $\text{mN}\cdot\text{m}$, $\mu\text{N}\cdot\text{m}$, $\text{kN}\cdot\text{m}$, lbf·ft, lbf·in, ozf·in	Exact
Energy	J	J, mJ, μJ , kJ, MJ, cal (IT), cal (thermochemical), kcal (IT), kcal (thermochemical), W·h, kW·h, Btu (IT), ft·lbf	Exact
Power	W	W, mW, μW , nW, pW, kW, MW, hp (550 ft·lbf/s), hp (electric), hp (metric), Btu (IT) per hour	Exact
Frequency	Hz	Hz, mHz, kHz, MHz, GHz	Exact
Rotational speed	rad/s	r/min, r/s, rad/s	Involves π
Angle	rad	rad, $^{\circ}$, mrad, ', ", gon	Involves π (except rad and mrad)
Voltage	V	MV, kV, V, mV, μV , nV, pV	Exact
Current	A	kA, A, mA, μA , nA, pA	Exact

Domain	SI unit	Units offered	Factor basis
Resistance	Ω	T Ω , G Ω , M Ω , k Ω , Ω , m Ω , $\mu\Omega$	Exact
Capacitance	F	F, mF, μ F, nF, pF	Exact
Inductance	H	H, mH, μ H, nH	Exact
Conductance	S	S, mS, μ S, nS	Exact
Electric charge	C	C, mC, μ C, nC, pC	Exact
Magnetic flux density	T	T, mT, μ T, nT, G (gauss)	Exact
Magnetic flux	Wb	Wb, mWb, μ Wb, Mx (maxwell)	Exact

The form shows each unit as name plus symbol, for example "pound-force foot (lbf·ft)". The table above uses symbols only to save space.

5.1 Exact factors from definitions

Inch-pound factors are not typed in as rounded decimals. They are built, in exact fractions, from a few defining values:

Definition	Exact value	Units built from it
International inch (1959)	1 in = 0.0254 m	ft = 12 in, yd = 3 ft, mi = 5280 ft, mil = 0.001 in, in ² , in ³ , ft ² , ft ³
Avoirdupois pound (1959)	1 lb = 0.453 592 37 kg	oz = lb/16, gr = lb/7000
Standard gravity	$g_n = 9.806\,65\text{ m/s}^2$	kgf = 9.806 65 N; hp (metric) = 75 kgf·m/s
Pound-force	1 lbf = lb × g_n = 4.448 221 615 260 5 N	ozf, lbf·ft, lbf·in, ozf·in, ft·lbf, hp (550 ft·lbf/s), slug = lbf/(ft/s ²)
psi	1 psi = lbf/in ² = 8 896 443 230 521 / 1 290 320 000 Pa ≈ 6894.757 293 168 36 Pa	psi
US gallon	1 gal = 231 in ³ = 3.785 411 784 L	liq qt = gal/4, liq pt = gal/8, fl oz = gal/128
Standard atmosphere and torr	1 atm = 101 325 Pa; 1 Torr = 101 325/760 Pa	mTorr = 0.001 Torr
Calorie (IT)	1 cal (IT) = 4.1868 J	kcal (IT); Btu (IT) = 1055.055 852 62 J (SP 811 footnote 9)

Because these are exact, the factor row reads "Yes" and the full-precision value is the true value to 15 significant figures. SI prefixes are exact powers of ten.

5.2 Factors that involve π

The degree, arcminute, arcsecond, gon, revolution per minute and revolution per second are defined through π (1 r = 2π rad, $180^\circ = \pi$ rad). Their factors are exact by definition, but π is irrational. The converter stores them as a fraction times a power of π . When π cancels, the conversion stays exact: degree to arcsecond is exactly 3600. When π does not cancel, the result is computed in IEEE-754 double precision, correct to about 15 digits. The card then shows the basis "exact by definition (involves π)" and a note saying so.

5.3 Temperature

Temperature conversions go through the kelvin, with an offset (an affine conversion):

$$T_{\mathrm{K}} = s_{\mathrm{from}}(t + c_{\mathrm{from}}), \quad t_{\mathrm{to}} = T_{\mathrm{K}} / s_{\mathrm{to}} - c_{\mathrm{to}}$$

Unit	Scale s (K per unit)	Shift c
kelvin (K)	1	0
millikelvin (mK)	0.001	0
degree Celsius (°C)	1	273.15
degree Fahrenheit (°F)	5/9	459.67
degree Rankine (°R)	5/9	0

All five are exact. A value that would fall below 0 K is refused. Temperature difference uses the scale only: 1 °F = 1 °R = 5/9 K = 5/9 °C.

5.4 Tabulated factors and the acre

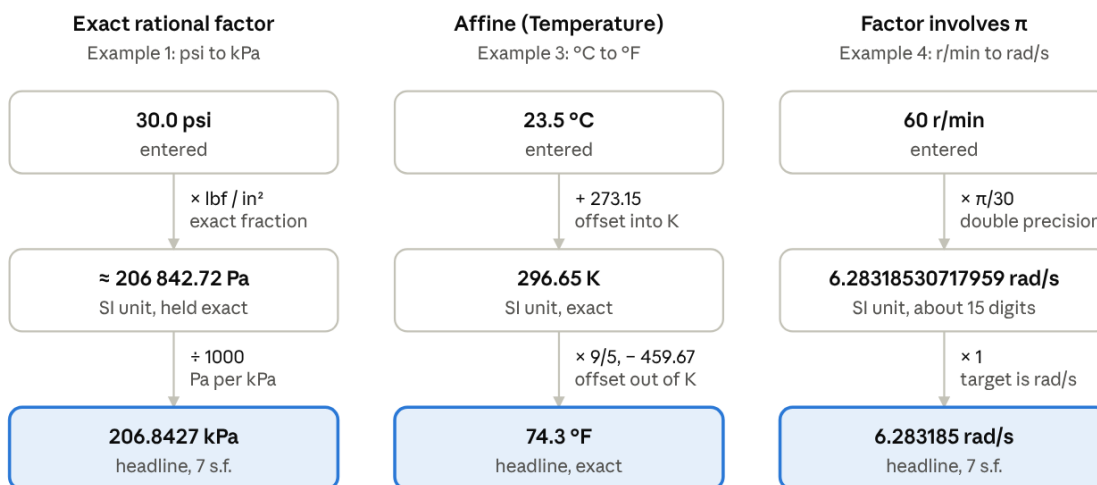
The two inHg units use SP 811's tabulated values, 3376.85 Pa (60 °F) and 3386.38 Pa (32 °F). SP 811 footnote 12 says more digits are not justified, so the factor row reads "No" and the headline is limited to 6 significant figures. The conventional mmHg and the torr are both exact; they agree to 7 significant figures and first differ in the 8th.

The acre uses the international foot: 1 acre = 43 560 ft² = 4046.856 422 4 m² exactly. SP 811:2008 prints the survey-foot value, 4.046 873 E+03 m²; the card marks it superseded and explains why in a note.

6. Calculation method

The converter picks one of three paths from the domain and the units, then applies the same display rules to every result.

Every conversion passes through the SI unit of its domain



Each result is then shown three ways: Factor Precision (the headline), Full Precision (15 s.f.) and SP 811 §B.7.2.

conversion paths · exact, affine, π

Figure 1. The three conversion paths. Each goes through the SI unit of its domain; only the π path uses double precision. Values are from Examples 1, 3 and 4.

Multiplicative domains (all but the two temperature domains). With f the factor of each unit to the SI unit:

$$y = x \cdot \frac{f_{\mathrm{from}}}{f_{\mathrm{to}}}$$

The calculation is exact when both factors are exact. When a factor involves π , each factor is a fraction q times π to a power p , and the π part is evaluated in double precision only when it does not cancel:

$$y = x \cdot \frac{q_{\mathrm{from}}}{q_{\mathrm{to}}} \cdot \pi^{\left(\frac{p_{\mathrm{from}}}{p_{\mathrm{to}}} \right)}$$

Temperature uses the affine formulas in 5.3. **Temperature difference** uses the scale ratio only, $y = x \times s(\mathrm{from}) / s(\mathrm{to})$.

SP 811 B.7.2 rounding. The last digit you type sets the input's half-unit h . That half-unit is carried through the conversion, and the result is rounded at the coarsest power of ten whose half-unit does not exceed it:

$$h = 0.5 \times 10^p, \quad \text{quad } H = h \left\lceil \frac{dy}{dx} \right\rceil, \quad \text{quad } k = \left\lfloor \log_{10}(2H) \right\rfloor$$

Here p is the place of the last typed digit ("36" gives $p = 0$; "30.0" gives $p = -1$), and dy/dx is the conversion factor. The result is rounded to a multiple of 10^k . For a multiplicative conversion this equals SP 811's relative-error comparison. For a temperature it is the same rule applied to the scale factor, since the offset does not change the rounding error.

Display rules for this calculator

Value on the card	Rule	Why
Headline and Factor Precision	Rounded half-even to 7 significant figures, or 6 when an inHg unit is involved; trailing zeros removed	7 is the precision SP 811 prints; a tabulated factor cannot support more digits than it has
Full Precision	Rounded half-even to 15 significant figures; trailing zeros removed	Shows the exact result to the limit of a 15-digit display
Rounded per SP 811 §B.7.2	Rounded half-even at 10^k from the formula above; zeros kept to that place	Never claims more precision than the entered value had
Factor text	Up to 15 significant figures; temperature formulas show 5/9 as 0.5555556	For reading only; the calculation uses the exact factor

All values are plain decimals, without scientific notation. Ties go to the even digit (SP 811 B.7.1 rule 3). Because trailing zeros are trimmed, an exact result that fits is shown exactly: 36 ft = 10.9728 m.

7. Reading the results

The headline states the conversion at factor precision, for example "30.0 psi = 206.8427 kPa". Below it, the card shows a disclaimer, the result rows, any notes, and MetTutor's written explanation. The PDF, Word and spreadsheet exports carry the same strings as the card.

Disclaimer (always shown): "Conversion factors follow NIST SP 811 Appendix B. For production calibration work, verify against your laboratory's procedures."

Which converted value to use

Row	Use it when
Converted — Factor Precision	The entered value is exact: a nominal, a specification limit, a defined quantity. Same value as the headline.
Converted — Full Precision	You carry the value into a further calculation and want no rounding loss.
Rounded per SP 811 §B.7.2 (if the entered value is a rounded measurement)	The entered value is a reading. This value keeps only the digits the reading supports.

The other rows

Row	What it shows
Source — Value, Unit, Symbol	The value as typed, and the From unit's name and symbol
Target — Unit, Symbol	The To unit's name and symbol
Domain	The selected domain
Kind	multiplicative (a factor), affine (Temperature, with offsets) or interval (Temperature difference)
Factor — Text	The factor used, e.g. "1 psi = 6.89475729316836 kPa", or the two temperature formulas through kelvin
Factor — Exact	Yes when both factors follow from definitions; No when an inHg unit is involved
Factor — Basis	exact (definitions); exact by definition (involves π); tabulated (SP 811 footnote 12), not exact; or exact (same unit)
Rounding — Rule	"SP 811 B.7.2: digits consistent with the input's rounding error; ties to even"
Rounding — Source Last Digit Place	p, the power of ten of your last typed digit (0 for units, -1 for tenths)
Rounding — Rounding Place	k, the power of ten the B.7.2 value is rounded to
Source Sp811 and Target Sp811 — Unit, Section, Footnotes, Printed	The SP 811 section (B.8), any footnotes, and the value SP 811 prints for that unit in SI units

When a unit has no printed SP 811 row, the Printed row says "no SP 811 row needed (SI prefix of the base unit)", or names the gap (for example, the millitorr and the revolution per second are derived). For the acre it adds "(superseded here, see notes)".

Notes appear only when they apply: the temperature note (an offset applies), the temperature difference note (scale only), the π note, the inHg tabulated-value note, the torr/mmHg note and the acre note. "Exact" always describes the factor, never the result. A result is only as good as the value you entered.

8. Worked examples

Every calculator value below was copied from a run of the production code on the composed form text, and checked by hand in exact arithmetic. Examples 2 and 4 are live tests C2 and C5 of the validation record.

Example 1 — Gauge reading, psi to kPa (exact factor)

Field	Entered
Unit domain	Pressure
Value	30.0
From unit	psi
To unit	kilopascal (kPa)

Hand calculation:

- 1 lbf = 0.453 592 37 kg × 9.806 65 m/s² = 4.448 221 615 260 5 N (exact).
- 1 in² = 0.0254² m² = 0.000 645 16 m² (exact).
- 1 psi = 4.448 221 615 260 5 / 0.000 645 16 = 6894.757 293 168 361 3... Pa = 6.894 757 293 168 361 3... kPa.
- 30.0 × 6.894 757 293 168 361 3... = 206.842 718 795 050 8... kPa.
- B.7.2: the last digit is tenths, so p = -1 and h = 0.05 psi. H = 0.05 × 6.894 757 = 0.344 74 kPa; 2H = 0.689 5; k = ⌊log₁₀ 0.689 5⌋ = -1. Round to 0.1 kPa: 206.8.

Calculator row	Value
Headline	30.0 psi = 206.8427 kPa
Converted — Full Precision	206.842718795051
Converted — Factor Precision	206.8427
Rounded per SP 811 §B.7.2 (if the entered value is a rounded measurement)	206.8
Factor — Text	1 psi = 6.89475729316836 kPa
Factor — Exact	Yes
Factor — Basis	exact (definitions)
Rounding — Source Last Digit Place	-1
Rounding — Rounding Place	-1

The factor is exact, so 206.8427 kPa is the true value to 7 figures. If 30.0 psi is a gauge reading resolved to 0.1 psi, report 206.8 kPa: the reading cannot support the extra digits. If 30.0 psi is a nominal test point, 206.8427 kPa is correct.

Example 2 — SP 811's own example, 36 ft to m (published known answer)

NIST SP 811 B.7.2 uses this case: 36 ft converts to 10.9728 m and, as a rounded measurement, is reported as 11.0 m.

Field	Entered
Unit domain	Length
Value	36
From unit	foot (ft)
To unit	meter (m)

Hand calculation:

1. $1 \text{ ft} = 12 \times 0.0254 \text{ m} = 0.3048 \text{ m}$ (exact).
2. $36 \times 0.3048 = 10.9728 \text{ m}$ (exact).
3. B.7.2: $p = 0$, $h = 0.5 \text{ ft}$. $H = 0.5 \times 0.3048 = 0.1524 \text{ m}$; $2H = 0.3048$; $k = -1$. Round to 0.1 m: 11.0.

Calculator row	Value
Headline	36 ft = 10.9728 m
Converted — Full Precision	10.9728
Converted — Factor Precision	10.9728
Rounded per SP 811 §B.7.2 (if the entered value is a rounded measurement)	11.0
Factor — Text	1 ft = 0.3048 m
Rounding — Rounding Place	-1

The calculator reproduces SP 811's published values. The exact result fits in 7 figures, so the headline shows it in full. The trailing zero in 11.0 is kept because it is significant.

Example 3 — Laboratory temperature, °C to °F (offset conversion)

Field	Entered
Unit domain	Temperature
Value	23.5
From unit	degree Celsius (°C)
To unit	degree Fahrenheit (°F)

Hand calculation:

1. To kelvin: $T = 1 \times (23.5 + 273.15) = 296.65 \text{ K}$.
2. To °F: $t = 296.65 / (5/9) - 459.67 = 533.97 - 459.67 = 74.3 \text{ °F (exact)}$.
3. B.7.2: $p = -1$, $h = 0.05 \text{ °C}$. $dy/dx = 9/5$, so $H = 0.09 \text{ °F}$; $2H = 0.18$; $k = -1$. Round to 0.1 °F : 74.3.

Calculator row	Value
Headline	23.5 °C = 74.3 °F
Converted — Full Precision	74.3
Converted — Factor Precision	74.3
Rounded per SP 811 §B.7.2 (if the entered value is a rounded measurement)	74.3
Kind	affine
Factor — Text	via K: $T = 1(t + 273.15)$; $t = T/0.5555556 - 459.67$
Factor — Exact	Yes

Notes row: "Temperature: converted through kelvin with the affine formulas (an offset applies). A temperature difference uses the Temperature difference domain." A tolerance of $\pm 0.5 \text{ °C}$ needs Temperature difference: there, $0.5 \text{ °C} = 0.9 \text{ °F}$. Entered under Temperature, the same 0.5 °C gives 32.9 °F , which is wrong for a tolerance.

Example 4 — Tachometer, r/min to rad/s (factor involves π)

Field	Entered
Unit domain	Rotational speed
Value	60
From unit	revolution per minute (r/min)
To unit	radian per second (rad/s)

Hand calculation:

1. $1 \text{ r/min} = 2\pi \text{ rad} / 60 \text{ s} = \pi/30 \text{ rad/s} = 0.104\,719\,755\,119\,66\dots \text{ rad/s}$.
2. $60 \times \pi/30 = 2\pi = 6.283\,185\,307\,179\,59\dots \text{ rad/s}$.
3. B.7.2: $p = 0$, $h = 0.5 \text{ r/min}$. $2H = 0.104\,72$; $k = -1$. Round to 0.1 rad/s: 6.3.

Calculator row	Value
Headline	60 r/min = 6.283185 rad/s
Converted — Full Precision	6.28318530717959
Converted — Factor Precision	6.283185
Rounded per SP 811 §B.7.2 (if the entered value is a rounded measurement)	6.3
Factor — Text	1 r/min = 0.10471975511966 rad/s
Factor — Exact	Yes
Factor — Basis	exact by definition (involves π)

Notes row: "The factor involves π : exact by definition, computed in double precision." The full-precision value equals 2π to all 15 figures shown. The validation record allows a π result to differ from the reference only in the 15th digit.

9. Refusals and troubleshooting

When an input cannot be read without guessing, the converter computes nothing. The card headline names the field, and the card says what to fix. Each message below was produced by the production code.

Message or situation	Cause	What to do
Cannot convert — invalid Value: "-300 °C is below absolute zero (0 K); a temperature cannot be lower than that."	A Temperature value below 0 K	Check the value and the From unit. A temperature cannot be lower than 0 K.
Cannot convert — unit mismatch in Value: ""Value: 30 psi" carries the unit "psi".	A unit typed in the Value field	Enter the bare number and choose the unit in From unit.
Cannot convert — invalid Value: ""Value" value "1,5" uses a comma."	A comma used as the decimal mark	Use a period: 1.5.
Cannot convert — invalid Value: "Could not find a readable "Value:" value. Found: "abc"."	Text that is not a number	Enter a number.
Cannot convert — invalid Value: "The value is outside the supported range (1e-30 to 1e30 in magnitude, or zero)."	Magnitude above 1e30 or below 1e-30	Choose a unit with a larger or smaller prefix so the value falls in range, and rescale the value to match (for example 1e31 pm = 1e19 m).
Cannot convert — missing Value: "Could not find a readable "Value:". Enter the number to convert, e.g. "Value: 36"."	The Value field left empty	Enter the value. MetTutor never assumes a default.
Cannot convert — invalid To unit: ""To unit:" must be a Pressure unit: pascal (Pa); ... Found: "meter (m)".	A unit from another domain (possible only in a typed request, not in the form)	Choose a unit from the selected domain's list.
Cannot convert — invalid Unit domain: ""Unit domain:" must be one of: Length; Mass; ... Found: "Speed".	A domain that is not offered	Choose one of the 24 domains.
The B.7.2 value looks too coarse (1 psi gives 7000 Pa)	"1" is read as known only to the units digit	Type the digits you actually read, e.g. 1.000.
A converted tolerance is far too large (0.5 °C gives 32.9 °F)	Temperature was chosen for an interval	Use Temperature difference for tolerances and drifts.

Message or situation	Cause	What to do
An inHg result shows only 6 figures	The inHg factors are tabulated to 6 figures	Expected. SP 811 footnote 12 says more digits are not justified.

10. Scope and limitations

- **One value, one pair of units, one domain.** Conversions across domains (mass to force, pressure to height of a liquid column) are not offered.
- **The 177 listed units only.** Other units, such as water-column pressure units, the U.S. survey foot or troy units, are not offered.
- **No uncertainty is propagated.** The converter scales a value. To convert an uncertainty, convert it as a value in the same domain; for a temperature uncertainty, use Temperature difference.
- **π factors are double precision.** They are correct to about 15 digits, which exceeds any calibration need. Exact results apply only where π cancels.
- **inHg is limited to 6 figures** by its tabulated factor. A result in or from inHg carries that limit.
- **The acre follows the international foot**, not the survey-foot value printed in SP 811:2008.
- **B.7.2 assumes your typed digits reflect the reading.** It cannot know a resolution you did not type.
- **The written explanation** is outside the numerical validation. Every number in it must come from the computed values, but rely on the card for the numbers.
- **Your procedures govern.** For production calibration work, verify against your laboratory's procedures, as the card's disclaimer says.

11. References

1. NIST SP 811 (2008 edition), *Guide for the Use of the International System of Units (SI)*, A. Thompson and B. N. Taylor. Appendix B, including B.7.1, B.7.2 and B.8.
2. NIST SP 330 (2019 edition), *The International System of Units (SI)*.
3. Federal Register 85 FR 62698 (5 October 2020), document 2020-21902: deprecation of the U.S. survey foot, effective 31 December 2022.
4. ISO 80000-4, *Quantities and units — Part 4: Mechanics*.
5. ISO/IEC 17025:2017, *General requirements for the competence of testing and calibration laboratories*, 7.11.2.
6. MetTutor validation record MT-VAL-SI-002 Rev B, SI Unit Converter, 18 October 2026, and the Validation Summary MT-VAL-SUM-001 Rev B.
7. K. Racen, *Deterministic Computation in AI-Assisted Metrology*, 2026. [Read the white paper.](#)

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