Quick-Start Guide

`parseCEAtransport` & `interpCEAtransport` (NASA-CEA TP files)

---

1. Parse the text file

```
% a) Keep native CEA units
tbl = parseCEAtransport('ceatransport.txt');

% b) Convert to strict SI units on import
tblSI = parseCEAtransport('ceatransport.txt', true);
```

Column	CEA units	SI units (`toSI = true`)
`P_bar`	bar	Pa (× 1 e5)
`mu`	mPa·s (milli-Poise)	Pa·s (× 1 e−4)
`k`	mW cm⁻¹ K⁻¹	W m⁻¹ K⁻¹ (× 0.1)
`Cp`	kJ kg⁻¹ K⁻¹	J kg⁻¹ K⁻¹ (× 1 e3)
all others	already SI	unchanged

---

2. Single-point interpolation

```
% Equilibrium viscosity at 40 bar, 2600 K, O/F = 5.5
mu_eq = interpCEAtransport(tbl, 40, 2600, 5.5, 'mu');

% If you parsed in SI units:
mu_eq = interpCEAtransport(tblSI, 4.0e6, 2600, 5.5, 'mu');
```

Property keywords

`rho` , `gamma` , `a` , `mu` , `k` , `Cp` , `Pr`

Only **`k`** , **`Cp`** , **`Pr`** depend on reaction model:

```
k_fr = interpCEAtransport(tbl, 70, 3000, 6, 'k', 'fr');
```

Optional interpolation method: `'linear'` (default) · `'nearest'` · `'natural'` .

---

3. High-throughput queries (recommended)

Build each `scatteredInterpolant` once, then reuse:

```
props = {'rho','gamma','a','mu','k','Cp','Pr'};
modes = {'eq','fr'};
cache = struct();

for p = props
    for m = modes
        key = sprintf('%s_%s', p{1}, m{1});
        if ismember(p{1},{'k','Cp','Pr'})
            sub = tblSI(tblSI.Mode==m{1}, :);
        else
            sub = tblSI;
        end
        cache.(key) = scatteredInterpolant(sub.P_bar, sub.T_K, sub.OF, ...
                                           sub.(p{1}), 'linear', 'linear');
    end
end

% fast lookup
k_val = cache.k_fr(7.0e6, 2900, 6.2);   % Pa, K, O/F
```

---

4. Troubleshooting checklist

Symptom	Likely Cause	Fix
Empty table	File missing **TRANSPORT PROPERTIES** block	Verify CEA run included TP output
Text scalar error	Parser found no numbers in a line	Use the latest parser (handles empty matches)
Slow loop queries	Rebuilding interpolant every call	Cache interpolants as in § 3

---

5. Function signatures (concise)

```
tbl = parseCEAtransport(txtFile, toSI)
% toSI : false (default) keeps CEA units; true converts to SI

val = interpCEAtransport(tbl, P, T, OF, prop, mode, method)
% mode   : 'eq' (default) | 'fr'   % ignored for rho, gamma, a, mu
% method : 'linear' (default) | 'nearest' | 'natural'
```