



AD FALCON API Manual

Nodes

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1 Nodes

The % Nodes section defines the mesh nodes (IDs and coordinates). Node IDs are referenced by other sections (elements, boundary conditions, loads), so this section is typically placed near the top of the input file.

For general rules about comments, numeric formats, and the \$name tagging feature, see [Input File Structure](#).

1.1 Section header

FALCON treats section names as case-insensitive and whitespace-insensitive (and it ignores _ and -), so these headers are equivalent:

```
% Nodes
%Nodes
% nodes
%  NODES
% Node_S
% Node-s
```

1.2 Syntax

```
% Nodes
<NodeID> <x> <y> [z]
<NodeID> <x> <y> [z]
...
%%%
```

1.3 Rules and behavior

- **Node IDs:** Must start at 1 and be strictly sequential (1, 2, 3, ...) with no gaps.
- **Coordinates:**
 - PL* and AX* analyses require at least **2** coordinates per node (x y).
 - ThreeD* analyses require at least **3** coordinates per node (x y z).
 - For 2D/axisymmetric analyses, an extra z coordinate may be provided but it is not used by the kinematics.
- **Separators:** Values are whitespace-separated (spaces or tabs).
- **Comments:** # starts a comment anywhere on the line (inline comments are allowed).

1.4 Tagging numeric values (optional)

You can tag a numeric coordinate by inserting a \$name token immediately before it. Tags do not change the analysis values; they are metadata used for parametric studies and surrogate training.

The first token on each node line must still be the integer NodeID (do not place a \$tag before the node ID).

Examples (all equivalent for analysis):

```
% Nodes
1 0.0 0.0
2 $x2 1.0 $y2 0.0
3 $x3=1.0 $y3=1.0
4 $x4 = 0.0 $y4 = 1.0
%%%
```

1.5 Examples

1.5.1 2D mesh (plane strain / axisymmetric)

```
% Nodes
1 0.0 0.0
2 1.0 0.0
3 1.0 1.0
4 0.0 1.0
%%%
```

1.5.2 3D mesh

```
% Nodes
1 0.0 0.0 0.0
2 1.0 0.0 0.0
3 1.0 1.0 0.0
4 0.0 1.0 0.0
5 0.0 0.0 1.0
%%%
```

1.6 Troubleshooting

- **Non-sequential IDs:** If you skip an ID (e.g., 1, 2, 4), FALCON reports a format error. Renumber nodes sequentially.

- **Too few coordinates:** Ensure each node line has at least $x \ y$ (2D/axisymmetric) or $x \ y \ z$ (3D).

